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ENGINEERING AND MINING JOURNAL

JANUARY, 1943

ooking down the 270-ft. length of the rotary kiln with which Anaconda Copper Mining Co. produces manganese oxide nodules from rhodochrosite flotation concentrate

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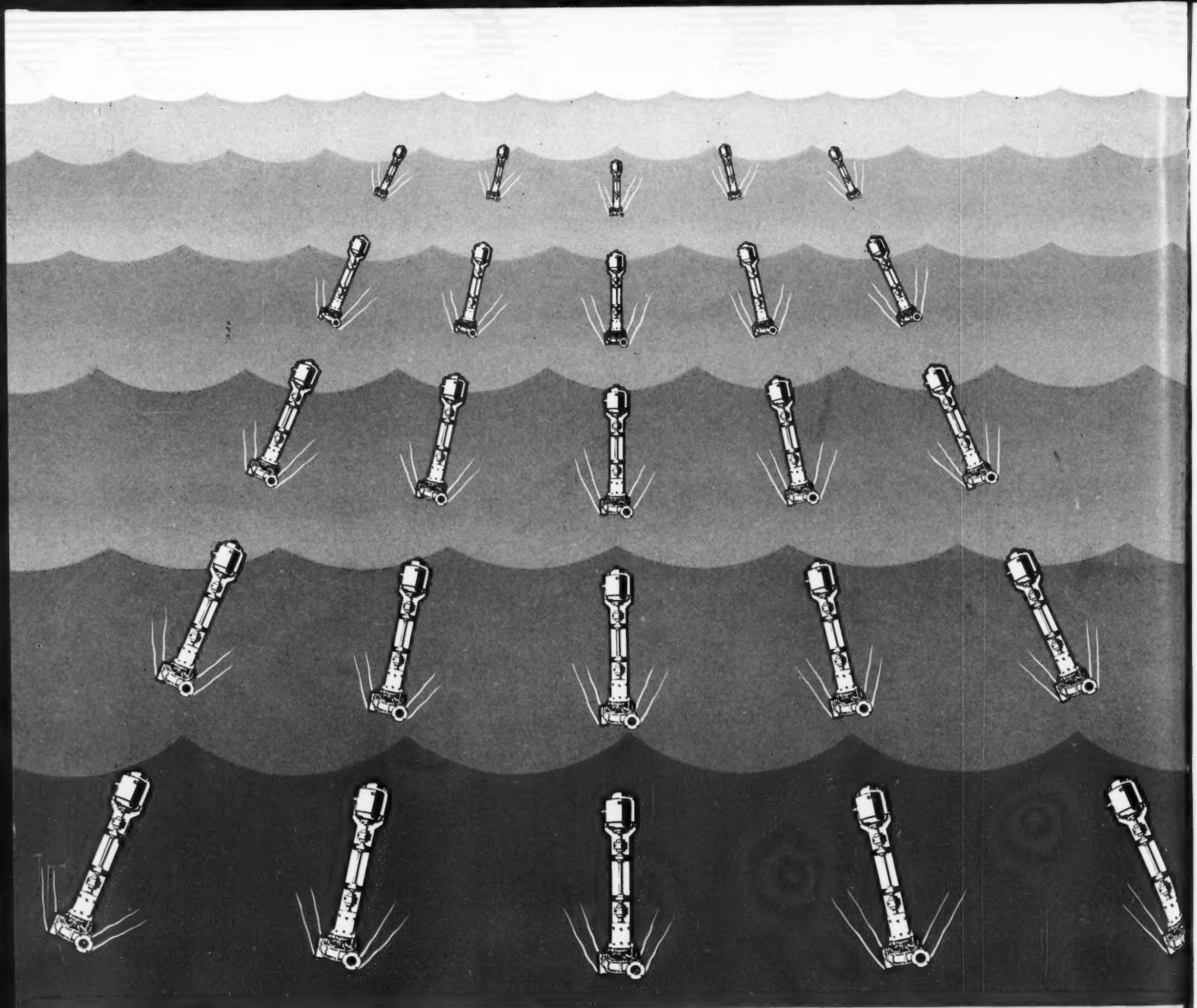
Gold Lodes of Bolivar, Venezuela
A Look at the New Texas Tin Smelter
Mining and Washing North Carolina Kaolin
How to Get a Mining Loan
An Arkansas Travelogue
Barytes in Eastern Tennessee
Complete Contents on Page 35



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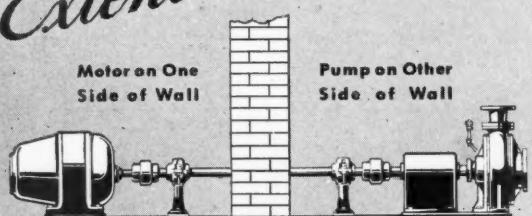

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Next month, *E.&M.J.*'s Annual Survey and Outlook Number will make its appearance, the 74th of its kind in the 76 years of the *Journal's* existence. A unique, eventful year was 1942, marked in the mining industry by achievement, change, and surprise. This review, in three parts, will cover: (1) the economics of the metals, base and precious, in their varying degrees of importance; (2) operating activities at home and abroad, summarized by countries; and (3) the year's developments and trends in mining, milling, and metallurgy. A great deal will be compressed within the issue's covers. Copies should be ordered early, as the number to be printed will be strictly limited. The price will be One Dollar.

▼

Past and present. After two decades of contemplation as to what might happen to mining and the individual engaged in it, should war again be visited on this country, one nevertheless stands fascinated, as he looks backward from the New Year's threshold at the actualities of 1942. Many things indeed did happen here, suggestive even as they transpired of more to come. The February survey, announced above, will make this clear.

▼

Eastward and westward, to the Old World and to the Orient, war conditions have narrowed *E.&M.J.*'s horizons temporarily to some extent. Southward, through Latin America to Cape Horn, however, this magazine's broadened view and increased circulation give ample compensation for this regretted circumstance. Never before has the *Journal* reached so many readers in the countries south of the Rio Grande. And the number increases with every mail. Next month's annual review includes this growing territory in its scope. The new coverage will not be transitory but, we feel, permanent and expanding.

▼

Welding finds many uses in the Garfield smelter. See p. 66.

A. M. STAEHLE
Publisher

ENGINEERING AND MINING JOURNAL

R. M. WARD
Manager

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H. C. PARMELEE
Editor

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COVER ILLUSTRATION: Looking down the 270-ft. length of the largest rotary kiln in the world, operated by Anaconda Copper Mining Co. to produce manganese oxide nodules from rhodochrosite flotation concentrate—Wide World Photos, Inc.

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ELECTRICITY is the mainspring that turns the wheels of our factories, mills and mines. It is the tireless arm that grinds our grain, weaves our cloth, pumps our water, builds our planes, our guns, our ships, our cars, our trucks and tanks . . .

The mighty Pharaohs had less energy at their disposal in building their pyramids than is generated today by one single power plant. The combined capacity of America's central power systems is without parallel in the history of the world . . . 46 million kilowatts, i.e., 65 million horsepower in steam turbines, hydro turbines and other prime movers. That is more power, day in and day out, than 650 million slaves could produce—for a limited time—minutes in fact.

The capacity of this vast fountain of energy is beyond the grasp of the average man who flips a switch and sets in motion machines that perform the labor of a thousand man-hours in a matter of minutes. Perhaps only the old time farmer, whose traditional source of power is a team of tired horses and a pair of calloused hands, knows how to appreciate this commodity that is so vital an ingredient of everything we consume and use.

Yes, we take electricity for granted. We expect it to appear in unlimited quantities, like water and air, as we need it. Almost as essential as these two elements in times of peace, it becomes a matter of life and death in times of war. Industry would collapse without it and the nation would quickly perish.

With the catastrophe of Pearl Harbor a little over a year ago, came the realization that we had to out-produce our enemies. To out-produce our enemies, who had a seven year head start, meant to turn more wheels than they were turning and to turn them faster than they were turning them.

New plants sprung up overnight. Production increased beyond our wildest dreams. Aircraft and shipbuilding surpassed the most daring forecasts. The machine tool industry's output grew to a volume that bordered on the miraculous. Guns, shells, uniforms, shoes, tanks and a thousand other items were being made in hitherto undreamed of quantities. All of them have one common essential ingredient – power. Industry demanded power – more and more power!

It is no small tribute to the power industry that, while other raw materials developed shortages necessitating strict priorities control, electricity remains unrationed – no priorities, no curtailments, no rate increase. Current industrial consumption is running 16 per cent over 1941 and 50 per cent over 1940. Not spectacular perhaps but when we consider that the nation's 26 million domestic consumers utilize only about 14 per cent of the energy output, we begin to get some idea of industry's power consumption.

Our power companies might have been stunned by the prospect of mounting demands for kilowatts. Instead they set about developing and coordinating a multiplicity of relatively small and seemingly unrelated factors. Individually or even collectively, these have not been of a spectacular nature. Certainly they have not inspired the award of the Army-Navy E although they are an essential ingredient in every Army-Navy E that has been awarded to American industry.

The contribution of the power industry to the winning of the war is not likely to flame forth in newspaper headlines. It takes the more prosaic turn of portraying an industry that is doing wonders quietly, unobtrusively.

At the close of the last war the power at the disposal of the American industrial worker averaged 3⅓ horsepower. At the beginning of this war, twenty years later,

This is the seventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

it had increased to 6½ horsepower. What other nation can even approach that figure? This large provision of power is the achievement of the electric utility industry. For years it had built and applied its equipment to the highest standards of performance and operated its systems to equally high standards of service and dependability. Always recognizing that "public service is a public trust" it had maintained wide margins of security in performance. Today these margins are the source of the power industry's ability to rise to the emergency.

In short, the electric utilities were prepared!

Power men are accustomed to looking ahead, to prepare for growing loads and allow for unforeseen contingencies, for electricity cannot be stored. It is "ordered" by touching a switch. It is delivered and consumed at the same moment.

Months before the actual outbreak of hostilities foresighted power men set to work computing how much life of equipment could be risked in the process of crowding it toward greater output. Generators, boilers, turbines, cables, transformers and even conductors underwent close scrutiny in an effort to increase the load – *safely*. They figured, they experimented, they tried untried measures.

Insulation, for example, is the crux – the least known component of electrical apparatus. When it lets go the service suffers. It is not easy to know how near any bit of crucial insulation is to letting go. It takes courage to work it to a point just short of failure . . . but that is exactly what is being done today.

Technological forcing of equipment, however, is not all of the story. Obsolescent equipment has been rehabilitated; salvage has been intensified; critical metals have been replaced by non-critical materials; water sprays, air-blowers and other cooling methods have been installed to keep over-loaded apparatus from over-heating. Nothing has been overlooked. Ingenuity has contrived the well nigh impossible.

Hand in hand with these measures of expediency have gone measures of intensification. Hydrogen pressure for cooling generators has been stepped up from ounces to pounds taking more heat away from the machines and enabling them to carry greater loads. Capacitors – little more than aluminum foil interleaved with thin paper – have been applied by the carload relieving the systems of that mysterious reactive current which is associated with that equally mysterious power factor. They have performed wonders in avoiding the need for additional generating and transforming equipment. The use of portable sub-stations has averted the otherwise necessary reserve capacity in fixed installations at many points.

When coal was placed on the urgent list last spring the electric utilities outstripped all other industries in providing storage for the winter. Stocks on hand the first of October were sufficient for 105 days, or more than twice what would be considered adequate in times of peace.

When staff losses to the armed forces became serious power companies contrived measures that enable them to get along without aggravating the national manpower situation by hiring others to replace them. Today meters are being read every two or three months instead of monthly; women are being trained to do drafting, keep the logs in power plants and sub-stations and to test meters in shops and laboratories.

On the summit of "Grandpa's Knob", a mountain overlooking Rutland, Vermont, stands a giant windmill that would have been the delight of Don Quixote. Towering 200 feet above the tree tops its mighty 175 foot propeller turns with the wind and drives a 1,000 kilowatt generator which feeds its output into the Central Vermont Public Service Corporation's power system. The most ambitious wind-turbine generator in the world, and a daring experiment of forward-looking men.

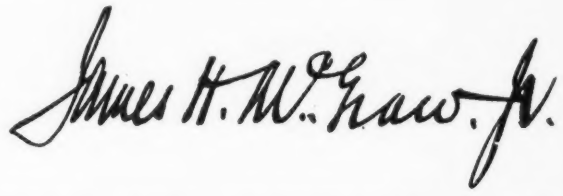
Today everything electrical is being tried; is being worked harder than it has ever been worked before.

Great credit is due the men behind the electric power industry. These men have recognized the responsibility of their jobs – it is a part of their very being. Theirs is the kind of service that *must* be maintained. No soldier is truer to his trust than is the employee of this great industry.

The service must go on! No matter what happens – acts of God or deeds of men – the service must go on! Labor disturbances may disrupt other industries but there have been no shutdowns due to labor trouble in electric power plants since Pearl Harbor.

And this winter when blizzards pile up drifts and sleet makes pavements slippery there may be absenteeism from other plants but the utility employees will be on the job ready to climb the ice-covered poles and repair the ice-laden lines whenever the call comes.

In this war the least costly yet the most precious element of production – electricity – will be ever ready to "man" the machines that will produce the weapons that will give victory to the forces of freedom.



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ENGINEERING AND MINING JOURNAL

H. C. PARMELEE, Editor

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VOLUME 144 — JANUARY, 1943 — NUMBER 1

Patents of Government Employees

SECRETARY ICKES is to be commended for his recent determination that patented inventions and discoveries made by employees of the Department of the Interior in the course of their official duties belong to the Government and not to the individual. Adoption of this policy in Interior is long overdue, and the sooner it is officially recognized throughout the Government the quicker an undesirable practice will be remedied.

Patents of government employees have been a bone of contention for many years, despite the fact that the elemental ethics involved are crystal-clear. If a government employee, engaged in research and experimentation for which he is hired and compensated, makes a patentable invention or discovery through the use of public funds and laboratory facilities, any resulting patents should be assigned to the Government as the representative of the people. Such patents should not belong to the individual.

Although "the interests of national security" were assigned as the Secretary's motive behind the new policy, it is not impossible that abuse of the personal patent privilege within the Department really brought the matter to a head. The mining industry has long been critical of a condition that resulted in patents being issued to government employees and assigned to a private corporation.

Technology in a Strait-jacket

ALL WILL ADMIT that technology is playing a vital rôle in the war, and that scientific and engineering techniques should be utilized to the fullest extent to achieve a speedy victory. But one would want to think twice, and hard, before giving approval to "S. 2721, a bill to establish an Office of Technological Mobilization, and for other purposes." You have no idea what "technological mobilization" can embrace until you have read the bill and the statements of some of its ardent proponents.

In our judgment S. 2721 represents the acme of regimentation, particularly of something that doesn't lend itself to that process, and which would wither and fade under its blighting influence. Those who believe they can legislate the fullest use of science, engineering, research, and invention do not understand the nature of these skills and talents or the atmosphere in which they thrive.

The purposes of the bill are expressed in high-sounding phrases, but the mechanism by which the ends are to be achieved reveals the inherent weakness of the plan. The Office of Technological Mobilization would be headed by a Director who would also be the Chairman of a board of four directors of the Technological Mobilization Corporation. The Director-Chairman would receive an annual salary of $12,000, and the four directors $10,000 each. Not princely salaries for officers of a $200,000,000 corporation, but probably more than enough when you realize that no qualifications are laid down for their appointment by the President. They need know nothing about technology. They could, and probably would, be politicians, lame ducks, or bureaucrats temporarily out of a job. In short, the bill provides five political plums; and all in the sweet name of technology of which the appointees would be blissfully ignorant.

But the powers of these patrons of technology would be tremendous. They would have full access to all governmental and private information on scientific personnel, technical facilities, research projects, development programs, and inventions. They could review and appraise established production methods and processes, and order alterations and changes therein. They could draft personnel and plant facilities, and convert them "to work deemed more essential." They could compel the licensing of patents and secret processes. And in addition to all these inquisitorial powers the Office could initiate projects through a staff of its town.

Need it be argued that probably no one having even a bowing acquaintance with technology conceived or wrote this bill? It is not only naïve in its conception and terrifying in its implications, but quite unnecessary to accomplish its declared purposes. The Government now has at its service a number of scientific agencies working on war problems. They are manned by scientists, not by politicians or economists or lawyers, and they enjoy inter-relations that give them access to technological

information without compulsion. Fortunately they are not regimented into a deadly political pattern, and we hope they will escape that fate through S. 2721 or any like measure.

Mining Industry Should Plan

WE KNOW that when this terrible conflict is over an effort will be made by the peoples of the earth to forestall the destruction of civilization by preventing war in the future. By the time an armistice is declared, the range and destructiveness of modern armaments will be so great that no people in their right mind will dare to risk a third World War. We also know that any realistic attempt to accomplish this will require an abandonment of both economic and political isolationism.

No aspect of post-war accord presents a knottier problem than that of accommodating the mineral industry to the political plans of the United Nations. The economy of mineral production, fabrication, and consumption is already internationalized to such an extent that it cannot be strait-jacketed without risking conditions that lead to war.

On the other hand, nobody informed on minerals assumes that free trade can be established suddenly without creating dislocations that we know people will not accept. A tremendous number of jobs and interests are ponded behind our tariff wall. Minerals are not evenly distributed, and full equality of access, as implied in the United Nations Charter, would demand not only abrogation of import and export duties, but free transportation, surrender of ownership, renunciation of local taxation, and equality of currency exchange. Many countries support their governments in whole or in part by taxes borne by mineral output and will have to load this burden on other groups of citizens if equality of access is to be achieved.

Considering the complexities of mineral distribution, ownership, and economy, it is evident that the status quo cannot be liquidated suddenly, and that a realistic attempt to fit mineral policies into post-war plans will demand the full cooperation of the mining industry. Both our public duty and intelligent self-interest dictate that we should be doing something toward formulating a post-war mineral policy, beginning now. Will the mining industry rise to this occasion, or leave its political problems to diplomats, politicians, bankers, and manufacturers, as it has done in the past, to the detriment of the public interest and of itself?

Other Industries Begin to Plan

BASIC, of course, to the post-war welfare of the mining business and, indeed, of the entire country, are active and prosperous manufacturing industries that consume the raw materials of the nation's natural resources. So one of the bright prospects for 1943 was the formal announcement on New Year's Day of the organization of the Committee for Economic Development, a peace-time planning group of able, liberal, and progressive business men and industrialists. They have voluntarily accepted the challenge of post-war problems of civilian production and employment, and have initiated a program of research and experimentation that promise success.

Being realists and firm believers in the obligations as well as the opportunities of private enterprise, they see the advisability of stepping up annual post-war civilian production to 135 billion dollars, and employment to 55 million jobs. How to reach these hitherto unattained goals is their principal concern, and the one to which their laboratory and field studies will be directed. We shall do well to put our faith in the opportunities afforded by private enterprise rather than in the security promised by a paternal government. The more we have of the former, the less we shall need of the latter. After all, governments have no resources of their own; they derive them only from the creative and productive talents of their people, which thus far have known no bounds.

Tribute to Henderson

FEW PEOPLE in mining have been wholeheartedly in favor of Leon Henderson and the price and ration policies now inseparable from his name. Nevertheless, we are in fairness bound to acknowledge and appreciate Henderson's achievements and character. He stood conspicuously alone among high officials in government in his steadfast devotion to duty regardless of expediency or political consequences.

Some day, if we find ourselves in the midst of a financial débacle, we may wish that Henderson had stayed, and that men of similar moral fiber had been in charge of other functions of government.

HISTORICAL SUMMARY: ENGINEERING AND MINING JOURNAL was founded in 1866 as the *American Journal of Mining*, the title being changed in 1869. The following publications have been consolidated with *Engineering and Mining Journal*: *Coal and Iron Record* (1875); *The Mining Review* (1877); *The Polytechnic Review* (1879); *Mining and Metallurgy* (1902); *The Mining Magazine* (1906); *Mining and Engineering World* (1917); *Mining and Scientific Press* (1922); *Engineering and Mining World* (1932). All rights to foregoing titles of consolidated publications are reserved by the publisher. . . . . The following have served as editors in chief of *Engineering and Mining Journal* and its predecessor publications: G. F. Dawson (1866-67); R. W. Raymond (1867-74); R. W. Raymond and R. P. Rothwell (1874-89); R. P. Rothwell (1890-1901); D. T. Day (1901-02); T. A. Rickard (1903-05); W. R. Ingalls (1905-19); J. E. Spurr (1919-27); A. W. Allen (1927-33); H. C. Parmelee (1933—) . . . The Editorial Staff of *Engineering and Mining Journal* comprises: H. C. Parmelee, editor; A. H. Hubbell, associate editor; J. H. Edwards, electrical editor; Evan Just, Robert H. Ramsey, W. N. P. Reed, J. B. Huttl, assistant editors; H. H. Wanders, market editor; G. J. Young, consulting editor.

Reflections from Washington

Washington News Bureau

THE LIKELIHOOD is increasing that the mining industry may soon have a spokesman in the high councils of the War Production Board. When it materializes, the position will probably be in the office of Ferdinand Eberstadt, program vice chairman of WPB. The job will be to mine production much the same as Charles E. Wilson's job is to military production, as well as that of acting as Eberstadt's "eyes and ears" on policy matters involving the mining, smelting, and refining of minerals and metals.

Consciousness of a need for a mining-industry spokesman in the "topside" of WPB is growing. WPB, like its predecessors, has always had a tendency to be production-minded in a fabricating sense more than in a raw-materials sense. Most of its metals and minerals divisions are more allocations agencies than they are production agencies. Its mining division is primarily concerned with the problem of equipment; the technical staffs with the development side of the picture.

Up to now there has never been anyone within the war administration set-up assigned to speak for mining as Wilson does for fabrication or William Jeffers for rubber. Yet the supply of metals and minerals is, and long has been, a definite limiting factor to the whole war production picture.

Henderson Out

LEON HENDERSON is out as wartime price boss, and, by the time this issue is printed, ex-Senator Prentiss M. Brown of Michigan will probably be in. Brown is the man who piloted the Administration's inflation-control law through Congress last fall, only to be beaten at the polls in November, partly for this achievement.

Henderson's demise represented an attempt by the Administration to head off outright inflation by appeasing the farm bloc and other special interests which threatened, through the new Congress, to hamstring price control in order to "get" Henderson. It also represented an attempt to conciliate popular resentment against rationing. Whether the groundswell against Henderson actually resulted from the inevitable bungling of a bureaucratic agency handling a big, new job, or from an attitude of accepting price control and sharing of inadequate stocks of necessities for "everybody but me," remains to be seen. More sober Washington opinion fears that there is too much of the latter attitude behind the blasts aimed at Henderson, who whatever his shortcomings, had the most thankless big job in Washington.

Inevitably, with this background for his inauguration, Prentiss Brown's policy will have to be an unfortunate and untimely one of appeasement, for a while anyway. Farm prices, at least, will be allowed to rise somewhat, which, in turn, will bring renewed demands from labor and will threaten the general price lid. In the rationing sphere, the attempt will be to make going without more popular—first, by emphasizing the necessity and, second, by simplifying the procedures. There is little reason, however, to expect that simplification will go to the extreme of replacing coupons with a voluntary abstinence campaign—although this will be seriously proposed.

Zinc Shortage Looms

ZINC CONTINUES TO BE TIGHT, with prospects for future concentrate production quite decidedly on the dark side. The premium price plan was the vehicle chosen to facilitate an increased production of copper, lead, and zinc. Even though Metals Reserve Co. had paid out over $12,500,000, in premiums for over-quota production up to Oct. 31, opponents of the plan claim that over-all production has not been increased a pound over what would have been brought out without the payments. Neutral observers are inclined, however, to a different view. They hold to the opinion that the production of these critical metals was sustained because of these premium payments when the lack of manpower and diminishing ore grades were working in the wrong direction. The fundamental trouble with the premium price plan as it affects zinc production is that the subsidy provided has been insufficient to cover the cost of the location and development of new ore reserves. Until prices or price equivalents adequate to facilitate this essential activity are provided, no important change in the zinc outlook is probable.

Steps are being taken to provide a remedy, which will probably be in the form of a revised scale of premium payments reaching to higher levels. Observers anticipate that the revisions, when effected, will provide subsidies in addition to those now available of 5½c. on zinc and 2¾c. on lead, per pound, available in whole, in part, or not at all, according to the judgment of the quota committee.

Quartz Crystals Needed

QUARTZ CRYSTALS have become an important article of commerce, and efforts to develop a domestic source of supply have begun in earnest. The demand for quartz is a direct result of putting the war on wheels. It is used to make oscillators for the radio sets installed in all the combat vehicles, whether they operate on land, on water, or in the air. In this rôle, quartz crystals are largely responsible for the inability of the enemy to intercept and decode the messages between units of our armed forces in time to do us any harm.

At present bulk of the supply comes from Brazil, where the quartz is mined largely by hand in remote locations.

The location of domestic deposits of this critical material would greatly aid the war effort and the finder will be amply rewarded. Prices range up to $10 per pound for the best grades, weight and usability of the crystal being the determining factors. Because quartz is widely found, the location of a number of deposits in this country is not at all improbable. But not all quartz will meet the requirements, which have been stated as follows: "In order to be satisfactory for radio purposes, each individual quartz crystal must weigh a half pound or more. Crystals must be water clear, and at least 30 percent of each crystal by volume must be free from cracks, bubbles, fractures, veils, flaws, and needles. Specimens from which only a few oscillator plates can be cut are expensive to work. Material that contains twinning is not satisfactory.

"Trimming, which can be done with an ordinary hammer, is important. Often a good piece of quartz crystal can be trimmed from a larger one by knocking off cloudy, fractured, or twinned portions."

Samples should be sent to R. B. McCormick, War Production Board, Room 1212 Temporary R Building, Washington, D. C.

Dilemma Over Fluorspar

STOCKS OF FLUORSPAR are down in spite of efforts to maintain or increase them. A price increase went through about a month ago, which was a part of the program to

encourage production. On the effective date, Nov. 23, the ceiling on crude ores was removed so that custom mills could pass on the price increase. The order did not remove the ceiling on the prices of finished products sold to the ultimate consumer. Although the order as written says exactly that, there have been frequent misinterpretations by the trade.

Results of the price increase were not known before the publication of a restricted shipping list about the first of the year. This list names plants to which metallurgical and ceramic grades of fluorspar cannot be shipped because of their excessive inventories. It is hoped that this will insure a more equitable distribution of the present supplies. Also, steel producers have agreed to curtail consumption (p. 78).

Manpower Merry-Go-Round

PAUL V. McNUTT is now the wartime manpower boss, with "final authority" over all phases of the problem except the determination of the number of men to be called into the armed services. The long struggle between McNutt's War Manpower Commission and Selective Service ended in December with a new executive order modeled after the WPB "charter," placing all authority in a single man who will be advised by a board.

Selective Service was transferred to McNutt's orbit, and voluntary enlistments halted. The secretaries of War and Navy, however, retain authority to inform McNutt, after "consultation" with him on labor supply, how many men they require for the fighting services. Thus, the final determination of the ratio between men in uniform and men in overalls remains with the President.

McNutt's power over the men in overalls, however, appears complete. His grant of executive authority permits him to prohibit employers from retaining in their employment "any worker whose services are more urgently needed elsewhere." This is in essence the Western mining and lumbering formula, in which indivdual workers are not specifically ordered to shift jobs but rather are "guided" into war positions through limits upon the rights of employers to hire.

Enforcement of this "sanction" against employers is available through another provision in McNutt's order permitting him to require that all hiring be through the U. S. Employment Services. Invocation of this authority must, however, await a strengthening of U.S.E.S. to handle the enlarged job. In the meantime, employers are being urged to cooperate voluntarily.

Coincident with McNutt's emergence to full authority was the issuance of a stop-gap plan for an "orderly withdrawal" of draftable workers from industry, pending the time when manning tables (*E&MJ*, Dec., p. 46) become generally operative. The new scheme is called an interim replacement schedule and is really a skeleton manning table. Notable difference is that replacement schedules need only State Selective Service director okay to be used on occupational deferment requests for not more than six months, rather than formal validation both by WMC and the director. Users of replacement schedules are expected to graduate into manning tables within the six-month period.

Bolivian Tin Strike

STRIKES IN THE TIN MINES of Bolivia will have no immediate effect on the supply of tin in this country. When the tin smelter erected in Texas by Defense Plant Corp. began operations last April, stockpiles of Bolivian and Netherlands East Indian tin ores were sufficient for a year of capacity operations.

The strike reported in the daily press in December was of short duration, but disturbances may break out again and may ultimately be serious from our standpoint. The present labor unrest is a continuation of the railroad strike that was fomented by enemy agents about a year ago in an attempt to overthrow the anti-axis Bolivian government.

These continuing labor disturbances put a strain on the Bolivian domestic economy that is hard to understand from this distance. Fundamentally, the amount of tin ore shipped to this country from Bolivia depends on the local food supply. Bolivia is a high, cold country that has little agricultural development, with the result that food must be imported. Foodstuffs that must be imported are paid for in the foreign exchange built up through taxes on exported mineral products. Actually the government is practically supported by the taxes paid by the mining companies.

Mine Relief Bill

SENATOR MURRAY'S BILL offering financial relief to mine operators caught between contractual obligations and government restrictions or labor shortages died with adjournment of the 77th Congress in mid-December, but the Montana senator expects to reintroduce his measure for consideration by the new Congress.

The bill would permit state or federal district courts to grant moratoriums for the duration of the war, relieving mine operators from contractual obligations and performance of certain development work on properties when they are unable to secure labor, power, supplies or equipment, or prevented from fulfilling obligations by government regulation. Chief immediate beneficiaries would be the gold mines shut down by WPB edict.

In addition, the measure authorizes Reconstruction Finance Corp. loans, at not more than 4 percent interest, for payment of local, county, or state taxes, maintenance of property, and to pay interest on outstanding obligations.

New Priority Ratings

Priority ratings for metal and mineral mines in the first quarter of the new year are in the top brackets of the preference rating catalog, in keeping with WPB's announced policy of putting essential maintenance and operations on a par with military production.

For maintenance and repair and for operating supplies, metal mines with P-56 serial numbers are eligible now to AA-1 ratings. Non-metallic mines are authorized to use the AA-1 for maintenance and repair, and AA-2X for operating supplies.

Production material and operating supplies for manufacturers of new mining equipment have an AA-2X rating for 90 percent of their requirements, and an AA-4 for the remaining 10 percent, which will be used only for such weights of carbon or alloy steel, copper, etc., as it is practical for mills to furnish. For manufacture of repair and replacement parts which are clearly separated on PD-25A applications, an AA-1 rating has been allowed for 90 percent of materials and an AA-4 rating for the remainder. Manufacturers, like the mines, are given an AA-1 rating for their own plant maintenance and repair needs.

Mexican Trade Agreement

THE MINING WORLD was naturally very much interested in the unusual features of the new Mexican trade treaty, signed Dec. 23 (p. 77). Several mine products were included, some of which will have the present rates wholly or partly restored "after the termination of the unlimited national emergency proclaimed by the President. . . on May 27, 1941." With the fashion in recent years of having various types of emergency serve political purposes this language warrants a certain amount of doubt that the rates involved will be raised when combat ceases. Such suspicions are fortified by the circumstances that an alteration of tariff rates on such commodities as zinc and lead concentrates is purely a paper transaction for the duration of the arrangements whereby these materials are imported by Metals Reserve Co. Observers naturally wonder at the need for any alteration of a tariff which currently is

(*Continued on p.* 107)

Some Gold Lodes of Bolivar, Venezuela

A study of El Callao district, in which the New Goldfields and Mocupia companies are operating, indicates promising possibilities

Fig. 1 . . . El Chile lode, as seen on No. 2 level, West. It is a quartz-filled fissure

P. A. Bundy
Mining Engineer, Nevada City, Calif.

THE district herein described lies in southeast Venezuela, 120 mi. east southeast of Ciudad Bolivar, the principal port on the Orinoco River. The mineralized area is about three miles wide and five miles long, lying two miles south of the famous old mining town, El Callao. Its topography is a succession of heavily wooded foothills reaching elevations of 1,500 ft., separated by broad, sloping valleys which drain northward into the Yuruari River.

The temperature is even, averaging about 85 deg. F. The humidity is high. Average annual rainfall is 58 in., with heaviest precipitation during the months from October to April.

Spanish missionaries began mining placer gold about 1850 near the pueblos of Caratal and El Callao. These alluvials were worked intermittently and yielded considerable gold. The significance of this early work was that it facilitated the prospecting which led to the discovery and development of many rich lodes, such as the Callao, Chile, Columbia, Panama, Potosi, and Hanza. Somewhat later, the Laguna, "A," Union, and Sosa Mendez lodes were discovered. The Callao vein was worked to only 600 ft. of depth, and was the most famous producer, yielding an estimated 1,500,000 oz. from 700,000 tons of ore milled, 1870-1896. From the Chile vein 200,000 tons of ore was extracted, yielding an estimated 400,000 oz. of gold in eleven years.

Some of the lodes were ephemeral quartz lenses, though of excellent grade. Others, like the Chile, Laguna, Columbia, "A," and Union, are still yielding profitable ore and have been developed over strike lengths of from 2,000 to 4,000 ft., and down the dip from 600 to 1,400 ft., with good ore exposed on the present lowest levels.

Of the nine veins in the district being operated or developed at present, New Goldfields of Venezuela, Ltd., owns seven, and the Compañia Francesa de La Mocupia the two remaining.

Since the completion of a 500-ton mill in 1925, the annual gold production of New Goldfields has increased to near 100,000 oz., or more than three-quarters of the present Venezuelan total. This company's long and difficult struggle, gradually expanding into the profitable operation of seven producing mines, is a tribute to its organizers and to the management.

Present operations of the Mocupia company are also being gradually increased. The company's old stamp mill is being replaced by more modern milling machinery and two new units of 300 hp. diesel-driven generators have replaced the old gas engines formerly used. The Mocupia company has been fortunate in having rather consistently excellent ore from the strong Columbia lode. Late developments on the lowest level south of the dolerite dike have disclosed a considerable tonnage of unusually good ore.

General geology—In Fig. 2 the principal rocks of the area are shown.

The basaltic agglomerate occurs as a capping on the slopes and hills about Caratal village and to the south of El Callao. It is unrelated to the ore deposits.

The dolerite occurs as a single vertically dipping dike, 170 ft. wide and over three miles long, striking N. 80 deg. E. It cuts the Laguna lode obliquely, "A" lode underground, and extends northeast, passing just south of Caratal village, cutting the strong Columbia lode below the second level. Its contacts are generally sharp, but at the lodes considerable brecciation has occurred. The rock is fresh, showing dense borders but becoming coarser grained toward the middle of the dike. It is composed essentially of anorthite, augite, and biotite.

Generally the gold-quartz lodes and veins of the district occur in and along shear zones and pre-mineral fault fissures having a general east-west strike and dipping steeply south. With few exceptions they lie within the metamorphosed lava complex. The first period of ore deposition is manifested as quartz-filled fissure veins having definite walls with little or no metallization occurring outside the vein quartz (Figs. 1, 3.) The second, and most important, phase followed the pre-mineral fissures only approximately, spreading into and replacing the schist walls metasomatically.

The significant occurrence of aplite is as a dike 10 to 40 ft. wide, striking nearly parallel to, but cut by, the Laguna lode. It has been metamorphosed in the east section of the mine to a highly foliated sericite schist. Near the lode it is often extensively pyritized, but such occurrences generally do not constitute ore. The fresh schist is a light green color consisting chiefly of orthoclase, sericite, and quartz.

The diabase occupies the area immediately south of the lava complex, and also immediately north of the Union and Sosa Mendez lodes. It has intruded the lava series, and has complexly fractured zones over 150 ft. wide along its contacts. The diabase was an unreceptive host to deposition, apparently having resisted suitable fissuring and replacement necessary for ore concentration. A few small non-persistent quartz veins have been found in the diabase, but the production from them has not been of great significance.

Metamorphosed lavas (believed Pre-Cambrian) are the predominate rocks of the area, and contain the principal producing lodes. These rocks are characterized by their dark green color, fine-grain to dense texture, and

common exhibition of flow structure. They consist essentially of plagioclase, chlorite, hornblende, some biotite, and often small amounts of augite, or hypersthene. The plagioclase ranges from andesine through anorthite, labradorite being most common. The chlorite is secondary after hornblende. Quartz phenocrysts occur in the series about the Union Lode, converting the rock to a dacite. Calcite is present throughout the series in varying amounts. Flow structures are best observed in oxidized exposures, as exemplified at the Hanza, Chile, and Union lodes.

Rock alteration—Lodes and wall rock have been thoroughly oxidized to a depth of 100 ft. to 200 ft., with consequent ore enrichment. The broad Union lode in particular has been oxidized 200 ft. deep, which resulted in pronounced enrichment of a considerable volume of what was formerly low-grade sulphide rock. Here in the oxide zone the best values are generally associated with kaolin, limonite, and sugar quartz. The stringer lodes, being more pervious to ground waters, have yielded to oxidation more readily than have the fissure veins, and therefore show greater enrichment.

The three principal types of hydrothermal alteration found within or adjoining the lodes are propylitization, silicification, and sericitization. Of these three propylitization has been the most extensive. Particularly at the Union lode it has transformed the schist wall rock over 50 ft. on either side of and throughout the ore zones. At Laguna and "A" lodes, particularly, it has been the principal type of alteration. Its salient features are: the development of abundant chlorite and pyrite, with lesser amounts of calcite, siderite, and ankerite. In the process the dark-green andesites are transformed to a pale, brownish green, soapy rock. The ferromagnesian minerals have been altered to fine-grained felted chlorite partly replaced by silica, sericite, calcite, or ankerite. Pyrite occurs abundantly, replacing all other minerals.

Silicification has accompanied propylitization but is less extensive. Certain schist ore zones show intense silicification and erratic quartz stringers with the development of considerable fine-grained pyrite, often constituting high-grade ore. The replacement by silica produces a hard, gray, flinty rock.

Sericitization has accompanied chloritization, especially adjacent to and within the veins and lodes. Its presence appears to have had no deterrent effect on gold deposition, as some of the highest-grade free-gold ore has been found associated with quartz and fine-grained, felted sericite.

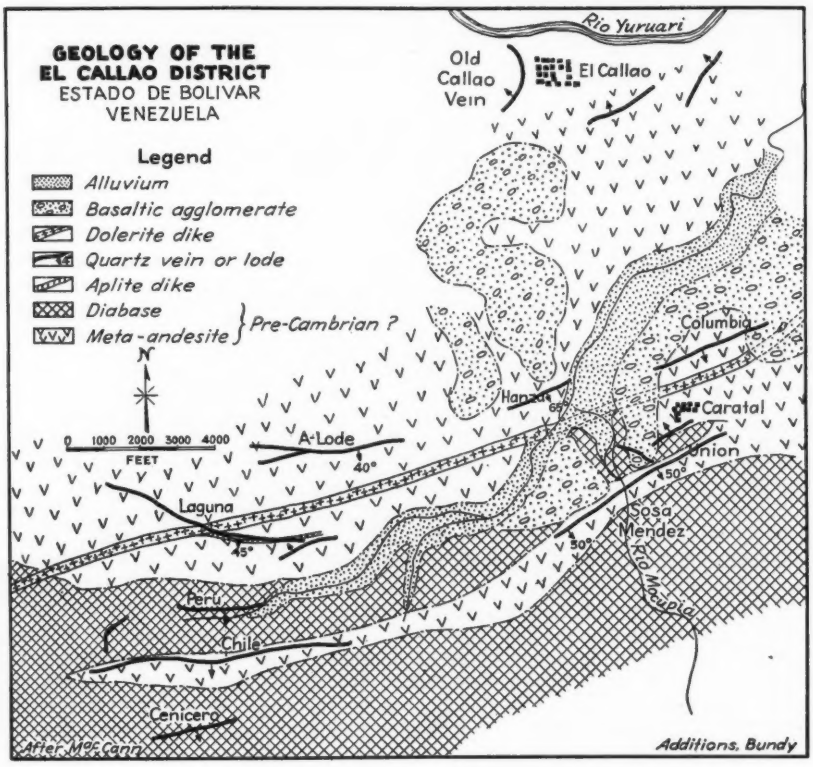


Fig. 2 . . . Principal rocks and vein systems of El Callao

In regard to ore deposition, no differential competency between silicified and chloritized schist has been established. Good ore occurs in both types.

Relative to the time of ore deposition, wall-rock alteration appears to have begun early and continued late. The evidence is convincing at the Union, Sosa Mendez, and Laguna lodes, and certain sections of "A" lode. At the Columbia, however, such evidence is lacking. Alteration on the lowest levels is slight and is confined to the schist contained in the lode.

Orebodies—There are three characteristic types of deposits: fissure-filled quartz veins; quartz fissure veins, combined with later quartz-stringer lodes accompanied by some replacement; and quartz-stringer lodes accompanied by extensive sulphide replacement of schist.

The fissure veins (Chile, Hanza, and Pryor veins belong to this class) are generally above average grade, contain appreciable proportions of free gold, and are not accompanied by wall-rock ore mineralization. The best example is the Chile vein, developed 2,000 ft. along its strike and 1,000 ft. down the dip. Vein widths average 3½ ft. Values occur as free gold. Negligible amounts of barren pyrite occur near the clean walls (Fig. 1 at the top of the preceding page).

The Hanza vein is similar to the Chile, although its productive strike length is but 700 ft. and it has been developed only 350 ft. along the dip.

The Pryor vein differs slightly in that it frequently carries pyritized schist as a part of the vein filling as well as the common quartz.

Within the second class fall the fissure-stringer combinations. They are characterized by an original quartz vein forming a nucleus, along and into the schist walls of which were deposited quartz stringers and replacement ore (Fig. 3). Free gold commonly occurs in the quartz vein ore, with sulphide replacements of schist furnishing the remaining values. The replacement ore is commonly equal to or better in tenor than the quartz veins, and invariably supplies the greater part of the tonnage removed. Generally the stringer lode deposition has proceeded along small fractures, schistosity planes, and branch slips of fissures dipping much flatter than, but having the general strike of, the schistosity of the shear zones. Changes in dip are common; rolls, flats, with strike and dip splits, or branches, are frequent. To this class belong the Laguna, "A," and Columbia lodes. Most extensively developed of these is the Laguna, which has been productive, with but slight interruptions, over a strike distance of 3,000 ft. and down the dip for more than 1,100 ft. The dolerite dike intersects the lode obliquely on the western end. Toward the eastern section of the mine the strike swings nearly due east, paralleling an aplite dike. The dip varies from 40 deg. in the upper levels to 50 deg. through the lower levels, with frequent flat sections occurring. These rolls in dip

of lode and schistosity have been proved to carry unusually good-grade ore of both replacement and vein types. The reasons are not obvious, but concentration through such sections is believed to be a result of greater permeability of schist foliations to rising metalliferous solutions and the tendency of the schistosity to form intermediate reservoirs by partly checking or impeding the upward movement of the ore-bearing solutions.

Orebodies are irregular and may pinch or become impoverished along the dip or strike in a short distance. Widths range from 5 to 20 ft. and individual oreshoots range from 50 to 600 ft. in breadth, with pitch lengths variable.

The Columbia lode is a banded-quartz lode, in part replacing andesite schist but commonly composed of massive quartz. Its dip is 40 deg. S. At 200 ft. below the surface the dolerite dike intersects the lode almost parallel with its strike. A strong lode with good ore persists south of the dike. The mineralization and ore occurrences are somewhat similar to those of the Laguna lode, though a greater portion of the value occurs as fine-grained free gold. Lode widths are commonly 6 to 15 ft. The section of the lode being worked by the Mocupia company has been productive over 1,000 ft. along the strike and 400 ft. down the dip.

At "A" lode the orebodies are in general similar to those of Laguna, excepting that the best ore occurs as quartz stringers accompanied by replacement of schist. From east to west the mine shows a gradual transition from a wide replacement lode to a relatively narrow quartz vein with definite walls.

Of the wide sulphide-quartz replacement deposits, the Union lode near Caratal village is the most characteristic example. The Sosa Mendez, though on a continuation of the same shear zone, lacks the erratic quartz stockwork, lenses, and broad metasomatic ore zones that characterize the Union lode.

The deposits occur within a dacite schist shear zone which dips 70 deg. Striking nearly parallel to the schistosity, through the center of the shear zone, is the pre-mineral Union thrust fault, dipping 53 deg. This prominent fracture extends through all levels of the mine and is obviously the route along which metalliferous solutions have entered, depositing in places within the main fissures, and at other places spreading into the altered schist walls, guided by branch slips or fissures, and affected by the recepitivity of the wall rock to metasomatic replacement.

Within the wide shear zone there are a number of flat north-dipping pre-ore fractures. In many instances ore solutions were spread widely by these transverse fractures, producing irregular masses of ore above and below them.

Where prominent north-dipping fractures join or cross south-dipping branch fissures, thick orebodies have developed, commonly as thick as 20 ft.

The majority of orebodies occur as quartz-pyrite replacement lenses in the schist walls, or along south-dipping branch thrusts from the main faults. They are commonly from 50- to 300-ft. breadth, and of greater pitch length, raking generally in the direction of dip.

Orebodies occur on either the hanging-wall or foot-wall side of the Union fault. Their general dip conforms to that of the fault, 53 deg. S., though when located along branch thrusts they may dip flatter or steeper.

With increase in depth of the Union mine, the diversity of ore occurrences encountered on the upper levels is gradually disappearing, and there is a marked tendency toward coalescence into a single main lode. A similar coalescence is also notable at the Sosa Mendez lode on the lowest level.

Dislocation and major rock fracturing, excepting some examples observed at the Chile, Laguna, and Columbia lodes, have been pre-mineral. They have furnished the structural control which has largely determined the location of ore deposition.

Post-mineral faulting at the Chile shows two major faults, displacing the western segment of the vein into the footwall. This faulting, however, preceded the formation of the Chile hanging-wall lode.

At Laguna a series of north-dipping faults have displaced the lode from a few feet to 60 ft.; they strike generally parallel to the lode and consequently hinder ore extraction. It is believed that these have been caused in the main by the upward lateral thrust exerted by the intrusion of the dolerite dike into the main mass of the meta-andesites.

At the Columbia two oblique faults appear to have occurred during the overlapping periods of lode-quartz deposition. Some mineralization has succeeded the faulting, but the principal deposition preceded it.

Mineralogy and Textures—The ore minerals are native gold and auriferous pyrite, with small quantities of chalcopyrite, bornite, galena, and sphalerite. Some pyrrhotite occurs in the Laguna and Union lodes.

The quartz veins generally show a crystalline, banded, ribbon texture. The free gold occurs in fine veinlets, meshlike, or as irregular bunches within the quartz. The Hanza vein exhibits frequent crustification and drusy structures in the oxide zone, with fine free gold commonly lining geodes and occurring with limonite and kaolin.

In the replacement ore, relict structures are common. Fine pyrite occurs widely distributed throughout the silicified chlorite schists. Quartz occurs generally as stringers, crossing or paralleling the schistosity. Metallization replaces both schist and quartz. Visible free gold is rare in this type of ore, although the tenor may be high.

Conclusion—The gold-bearing lodes exploited within this area show strong metallization and persistence, with general increase in tenor into the primary ore zones. The textures, structures, and mineralogy accompanying these lodes, with but few exceptions, are such as to place them in the mesothermal class.

Much promising outlying ground remains to be prospected. It is important that geological mapping be extended over the adjoining promising areas. A cooperative plan executed by the companies operating within the district and the Geological Department of Venezuela would add much toward a broader interpretation of the economic geology of this promising gold field.

I acknowledge, appreciatively, the helpful information given by the engineering staff of the New Goldfields, Ltd., the permission granted by the company for publication of the work, the assistance given by the mines staff, and the good photography of Ken Hall, chief assayer.

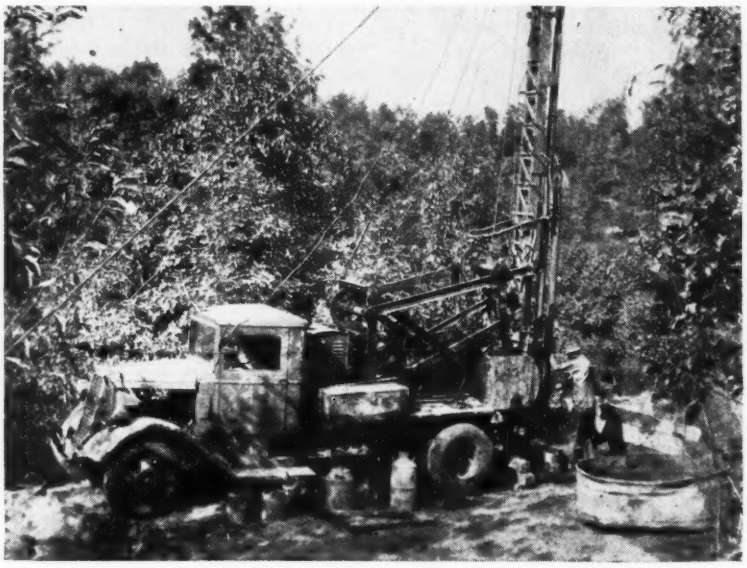
Fig. 3 . . . The Laguna lode, on No. 1 level, West. (1) Original quartz vein on footwall. (2) Later quartz stringers with sulphide replacement of meta-andesite

Fig. 4 . . . Laguna lode, on No. 2 level, West. Here are exhibited a pinch, a roll, and a split when the vein intersects aplite at (1), in lower right

An Arkansas Travelogue

II—The manganese and zinc deposits of northern Arkansas

Evan Just
Assistant Editor



Truck-mounted spudding machine used in manganese prospecting

ARKANSAS, where people used to come from, has been transformed into a beehive. Military establishments and war plants are scattered all over the State. Hotels are jam-packed; travel accommodations are crowded and off schedule. On buses, one stands a good deal of the time, hopes that the brakes of these overtaxed vehicles are in good repair, and wishes that the loquacious drivers would pay more attention to their driving. In southern Arkansas, the Texas love of conversation has spilled over the State line, and, except where safety is concerned, adds a good deal to better living.

Arkansas is a beauty spot throughout its extent, being largely hilly, forested, and well-watered country. The climate is pleasantly moderate, being neither as uncomfortable in summer nor as cold in winter as in many other parts of the country. A good part of the southern half of the State is tolerable to the long-leaf or Southern pine, which will probably develop into a great economic asset. Another interesting sidelight is the extent to which bermuda grass has captured the countryside, even in forested areas. Inasmuch as the grazing potentialities are only slightly used, this aggressive invader is generally regarded as a pernicious weed, its great capacity to support livestock being understood and utilized only on the part of a few. However, the rugged terrain of the State makes grazing, fruit growing, and timber cultivation its logical agricultural pursuits, rather than the growing of crops which invite erosion.

Probably but few states have as high a proportion of old American stock as exists in the people of Arkansas. Thus there is preserved the natural forthrightness and independence of this race—also some of its stubbornness and intolerance; as well as the willingness of hill people everywhere to settle their disputes forcibly, without the sometimes dubious benefit of the legal profession. Some of these people live under conditions of extreme poverty and backwardness. However, most of them respond well to education and other opportunities. As industrial workers they learn quickly, think for themselves, and are ingenious, loyal, and productive.

On the whole, Arkansas is a good place in which to live, with a friendly, capable people, and excellent possibilities for future development. In regard to minerals, their variety[1] is extraordinary, but, aside from bauxite, oil, barite, and common rock materials, much has yet to be proved.

After a week-end spent in a Little Rock jammed with soldiers and their visitors, the next stop was the Batesville manganese district, mainly in Independence County. Batesville, with a population of about 5,000, is the principal town of the district, which has been a source of manganese since 1849. The total production to date has been approximately 160,000 long tons of high-grade ore, containing over 35 percent manganese, and about 175,000 long tons of low-grade, ferruginous ore, containing from 10 to 35 percent manganese. The high-grade peak year was 1917, when 10,140 tons was produced. The low-grade peak of 13,774 tons was attained in 1929.

The Batesville ores[2] occur in an east-west belt 24 miles long and from 4 to 8 miles in width. They are mined at depths ranging from the surface to 100 ft. The orebodies are small, thin, and irregular. The carbonate ores, which furnish a minority of the production, are composed principally of rhodochrosite, hausmannite, and braunite, and occur as scattered, horizontal lenses, up to 9 ft. thick, replacing the upper beds of the Fernvale limestone, which varies in thickness up to 125 ft. The sedimentary formations are essentially horizontal. Underlying the Fernvale is the Kimmswick shale, and overlying it is the Cason shale. All of these formations are Ordovician. The Cason shale, ranging in thickness up to 12 ft., commonly contains manganiferous concretions, which in a few cases are minable. Overlying the Cason, or, in its absence, the Fernvale is the Boone formation, of Mississippian age, consisting of chert and limestone. In many of the mine shafts, the Boone is represented by a chert residuum.

The wad ores, which account for most of the production and consist principally of psilomelane, pyrolusite, and manganite, are the product of weathering of the carbonate ores and of disseminated manganiferous carbonates occurring in the upper 40 or 50 ft. of the Fernvale, principally in the uppermost 10 ft. This protore is usually dark gray, brown, or black. Wad ores are up to 15 ft. in thickness and run as high as 50 percent manganese. The average is about 25 percent. The weathering which produced the wad ores is considered to have occurred primarily in Mesozoic or Tertiary time. Wad ore is not found if any part of the overlying formations are unweathered. Prospecting "digs" are abandoned if they

[1] Branner, George C.: "Mineral Resources of Arkansas." Bull. 6, Ark. Geol. Survey; 1942.

[2] Miser, Hugh D.: "Manganese Carbonates in the Batesville District, Arkansas." U. S. Geol. Survey Bull. 921-A; 1941.

run into unweathered overburden or encounter unweathered protore.

According to Hewett and Miser[3] the carbonate ore and protore are of hypogene origin, and probably warm-water-borne. This is indicated by the usual origin of this mineral association and by the consistent paragenesis.

Except where the ore is found at or very near the surface, the typical method of mining is by means of small shafts, about 4x4 ft., and timbered with split-rail cribbing, without dovetailing. The shaft workings are known locally as "digs." Hoisting is done with windlass and bucket or with horse winches. If ore is found in a dig, it is taken out in 5x7-ft. drifts. Wad ore is removed with picks, without blasting. No openings properly called stopes are developed. If the ore is wider than a drift, a second slice is taken in a parallel or branching drift. Inasmuch as the wad ore is more or less claylike in consistency, ground support is required, and workings cannot be maintained an appreciable distance ahead of timbering, except in dry weather. The method of timbering is to set in crude cap-and-post drift sets, without braces, lagging the back, and also the walls if they are soft. In protracted wet weather it is common to lose about half the existing digs, partly because the drift sets are not braced against lateral movement and partly because of a tendency of the men to get too far ahead of their timbering, particularly if a pay day is in the offing. Because of the crude method of mining, only from 30 to 60 percent of the orebodies are extracted. At present about 250 men are employed in the industry. In hard times the personnel has shrunk to as few as 50 men.

Despite some hazard from caving and the usual risks of mining, and also the danger of suffocation from carbon dioxide, which tends to accumulate in unventilated workings, especially in warm weather, the industry has a remarkable safety record. The oldest operator, who has been in the district 19 years, can recall only two fatalities. This good experience has developed because there is not a large labor overturn in the district and the men have learned not to take chances. Many instances of asphyxiation have occurred, but adequate precautions had been taken to rescue victims in time to prevent death.

In unusual cases small power-driven blowers are used for ventilation. In many instances, hand-cranked blowers are used to pump air into disused digs so they can be safely entered, or to introduce a little new air in the course of work. Some interesting primitive methods of ventilation are commonly employed. One device is to hang a length of light weight, 6-in. oilcloth vent tubing down a shaft, with a 2-ft. joint of 6-in. stovepipe connected to the bottom. Just below the stovepipe is suspended a kerosene lamp, fed by a wick from a fruit jar containing kerosene. The convection current set up by a small flame is sufficient to entrain enough new air to provide for a man's requirements. Another similar device, able to pull more air, substitutes a stove at the top of the shaft for a lamp at the bottom. The vent tubing is connected to the air intake of the stove. A stove with a 10- or 12-ft. stack is able to afford considerable ventilation, provided the system is reasonably leakproof and the tubing is kept open.

At times when there has been a slack market for low-grade ore, it has been customary to beneficiate such ore by log washing. This operation, although wasteful, recovered about one-third of the low-grade tonnage as high-grade, marketable ore. This treatment has been possible because in many operations the wad ores consist of lumps of nodules of high-grade material in a sandy or clayey matrix.

The oldest operator in the district, with 19 years of uninterrupted experience, is the Walter H. Denison Manganese and Contracting Co., Inc., now managed by the founder's son, J. R. Denison. This firm, which operates principally around Pfeiffer, controls about 10,000 acres of fee and leased land. The Arkansas Manganese Co., managed by Jack Gibbon, is the second largest operator, holding about 800 acres near Cushman, consisting principally of what is known as the Aydelotte property. These two operators are also buyers and shippers of ore. Both of them use a labor contract system instead of direct employment. The workmen, usually in small partnerships, agree verbally to sell their ore to the operator at a posted price schedule in return for permission to mine upon land leased or owned by him. Ore is sold delivered to the buyer's dock, by the truckload: Although the usual method of settlement is based upon assays, the buyers frequently purchase ore on sight, f.o.b. the dig stockpile. The buyers usually haul the ore, but when sale is made on a delivered basis, hauling costs are deducted. Frequently the buyer will advance a footage payment to finance the sinking of a new dig. If ore is found, the footage is deducted from settlements. If not, the operator is out of pocket, there being no further obligation on the part of the workmen. Footage commonly runs from $1.25 to $1.50 per foot.

Other operators are: the Consolidated Mining Co., successors to the Hoxie-Rogers Co.; Chas. Sims; Livingston and Grace; King Rogers; Rogers-Bass Co.; and the Ozark Mining & Milling Co., with a 40-ton per hour concentrator at its St. John mine.

The typical mining lease pays the fee owner a 10 percent royalty on the value of ore shipped, f.o.b. cars. Some leases go as high as 15 percent if the property is unusually valuable.

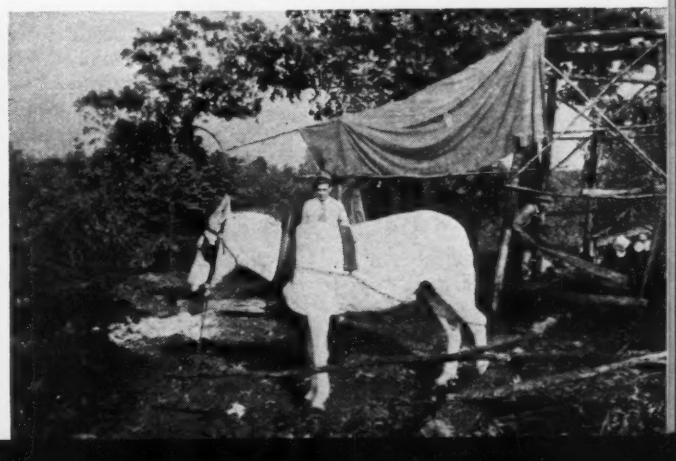
Prospecting is done with churn drills or test pits. The going cost of both is $1.25 per foot, with 25c. per foot extra if a drill hole is cased. Casing is done when ore is struck, to prevent contamination of samples. The typical drill is a truck-mounted, internal-combustion-driven, spudding machine. Drill hole samples are taken with a bailer or sand pump. One operator is taking core samples with an empty fishing socket, having one side cut off and bolted back on, as a coring device. Nobody has yet tried the cable-tool core barrels manufactured for such purposes.

Some months ago, to facilitate further production, the U. S. Bureau of Mines sank more than 400 test pits, principally on 400-ft. centers.

[3] Miser, *ibid.*

Sinking a typical manganese "dig" on the Aydelotte property in the Batesville area of Arkansas

Horse winch used to hoist manganese ore. K. M. Hays, of the American Zinc Co. of Arkansas, stands behind the "Arkansas canary"

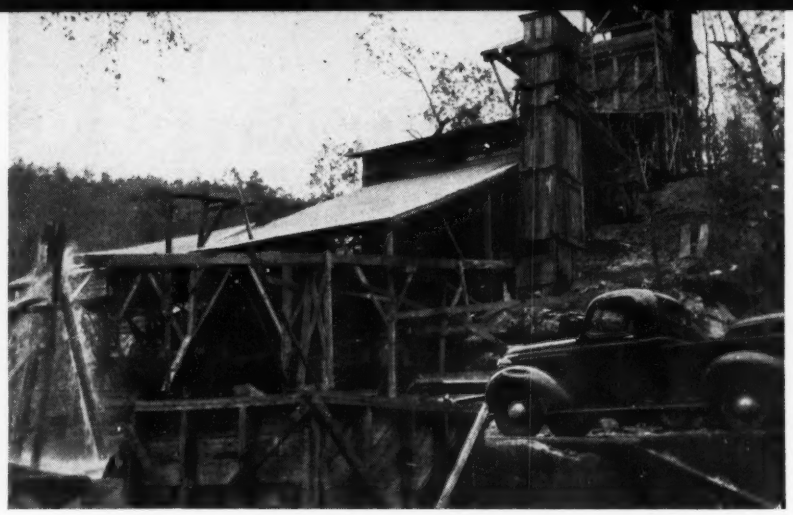


In favorable areas some testing was done on 200-ft. coordinates, and some drill-hole checking on 100-ft. intersections.

According to local operators, no attempts have been made to utilize geophysical work as an aid to prospecting. Nevertheless, it seems as though magnetic surveying and possibly gravity balance work ought to be given a trial. Although manganese is non-magnetic, at least some of the orebodies have sufficient associated iron oxides to affect a magnetic balance. Also, the high specific gravity of manganese ores might afford intelligible gravity anomalies, if the effect of rugged topography can be cancelled out. It is not suggested that either method would be effective enough to make drilling superfluous, but simply that geophysical prospecting may serve, along with geological skill, to limit the areas to be checked by drilling or test pitting.

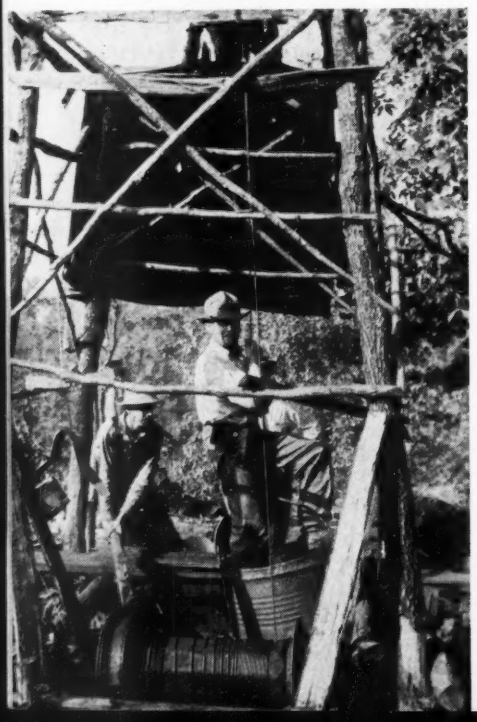
As part of its program of encouraging strategic mineral production, Metals Reserve Co. has established an ore-buying office in Batesville, in charge of C. H. Coleman, for the purchase of large or small lots of high-grade ores. Also, operating as agent of Metals Reserve, the American Zinc Co. of Arkansas is purchasing low-grade ore, which at present is being stockpiled at Cushman and Pfeiffer. Announcement has been made of plans of Defense Plant Corp. to build a beneficiation plant for the treatment of low-grade ores, but up to the present no actual construction has been undertaken, and it may not take place.

In behalf of the RFC, American Zinc has also undertaken development in the area. Options have been taken on a large acreage, consisting of the properties of the Arkansas Manganese and Denison companies, and a vigorous drilling campaign is being carried on, with a view to determining if these properties should be purchased by the government, with a view to undertaking operations on a larger and probably more efficient scale. At the time of my visit this company had 29 drills in operation. The options were originally written to expire in November, but because of unavoidable delays in the exploratory program extensions of time were obtained. It is now understood that Metals Reserve Co., has decided not to exercise the options, which circumstance indicates that the drilling results failed to check the estimates of ore reserves postulated by earlier investigators. Presumably, under these circumstances, American Zinc will abandon its operations in the district. However, this does not mean that the government will cease its purchasing of ores or the encouragement of private operations. John Inman, of Joplin, is in charge of American Zinc operations.



Excelsior zinc mill of J. C. Shepherd, near St. Joe, Ark.

Woodrow Turner, engineer for American Zinc Co. of Arkansas, being lowered into a manganese "dig" equipped with horse winch. The same bucket, made from an oil drum, is used for handling ore



The trip from Batesville to the zinc-lead mining area around Harrison and Yellville takes one through some of the most delightful scenery in the Ozarks. The dissection of the southern margin of the Springfield-Salem plateau by the White River and tributaries has caused topographic relief up to 600 ft., and many of the views would justify the term "mountainous." Most of the country is well wooded and sparsely populated.

The number of zinc-lead mines and prospects in northern Arkansas is truly amazing, particularly considering their small aggregate output.[4] The mineralization occurs principally in Boone, Marion, Newton, and Searcy counties, but is not confined to them. Lead ore has been known here since prior to 1818, and was of some importance to the early pioneers as a source of bullets. Three lead smelters existed in the area during the Civil War. Two short-lived zinc smelters were built in the early days at Calamine, in Sharp County, one in 1857 and the other in 1871. When the latter failed, zinc mining lapsed for several years, but was resumed in 1899, shipments being made to smelters outside the State. Maximum production was obtained during the first World War. In 1916 and 1917 approximately 7,000 tons of contained zinc per year was shipped. Peak production of galena occurred in 1910, 474 tons; of sphalerite and oxidized zinc ores in 1917—1,857 and 17,053 tons respectively. Production fell to a low level after the first World War, and activity was reduced to scattered "gouging" until the demands of the present emergency provoked a revival of interest.

At present there are numerous new activities. J. C. Shepherd, who mined the Big Hurricane and other properties during the last war, is now mining the Excelsior, St. Joe, and Bald Hill mines, and expects to resume at Big Hurricane. All of these properties are near St. Joe. The Big Hurricane mine has been the district's largest producer, having shipped 7,000 tons or oxide concentrates. The Excelsior, with a 10-ton-per-hour mill handling sphalerite ores, is currently the district's largest and steadiest producer. At Rush, Shepp Bros. and Lighter are operating the Leader Hollow mine, also a steady producer, with a 75-ton mill. Also at Rush are the Maricon Mining Co., with the Edith mine and Maricon mill, which operated during the summer but later shut down, and the Silver Hollow Mining Co., which has recently secured an RFC development loan. At Zinc, the Moark Mining Co. has just completed a 100-ton mill and is preparing to mine from a group of properties in the vicinity. Near by, to the west, Lex Magness is dewatering the Oswego mine. Cleve Bird is mining near Ponca City. At Jasper, the Newton County Mining

[4] McKnight, E. T., "Zinc and Lead Deposits of Northern Arkansas", U. S. Geol. Survey Bull. 853; 1935.

Edith mill of Maricon Mining Co., near Rush, Ark.

Leader Hollow mine and mill, Rush, Ark.

Co. is starting construction of a 100-ton central mill, intended to handle ores from some 2,000 acres leased in the neighborhood. At Eaton, the Victory Mining Co. completed a 75-ton mill in September, and in the same vicinity C. H. Gunter is operating the Casper mine. At Calamine, Bryant and Manning plan to erect a 150-ton mill and to reopen the old Fugate mine. Near Yellville, the Joplin Mining Co. has been drilling at the Beatty mine. Near Black Rock, drilling has disclosed lead ore, into which further investigations are planned.

The flowsheet of the Excelsior mill is typical of district practice. Gravity methods are employed to separate sphalerite from limestone, chert, quartz, and calcite. If any mines reach a sufficient stage of development to warrant the investment, better recoveries could no doubt be obtained by adding flotation. From the crude ore bin, ore passes to a jaw crusher, then to rolls in circuit with a trommel passing a ½-in. feed to a rougher jig. Rougher jig tailings are discarded and the concentrate is passed to a cleaner jig. The cleaner jig makes a finished concentrate in the hutch, a tailing which is discarded, and a middling which is rolled to table size. The table makes a clean concentrate, a tailing which is discarded, and a middling which is recycled to the rolls. Excelsior's mill operates on a diesel engine, driving a line shaft with belt take-offs to the machinery. This engine also drives the mine compressor and a 400-g.p.m. Layne pump, which dewaters the mine.

The ore deposits of the district are found at several stratigraphic horizons, principally in the Everton limestone (Ordovician) and Boone formation (Mississippian limestone and chert), but also in the Cotter and Powell dolomites (Ordovician, below Everton). The rock formations of the area, which range from Ordovician to Pennsylvanian in age, are essentially flat, with a slight regional dip to the south. Faulting is common, some of the faults being traceable for several miles. The primary ore minerals are sphalerite and galena, and the principal oxide minerals are smithsonite and calamine. The orebodies occur in a variety of shapes, as veins, fault gouge, runs and pipes, but always under fairly obvious structural control. Known orebodies are small compared to those of the Tri-State district, but like them show the same relationships to fractures, flexures, shattered zones, trunk channels of circulation, and favorable host rocks, that are characteristic of most ore deposits. In Arkansas, the association of orebodies with faults and fractures associated with faults is more conspicuous than in the Tri-State district. McKnight considers the primary ores to be of hypogene origin, a status which a consistent paragenesis, general structural associations, and the presence of silver, chalcopyrite and enargite, imply is also true of Tri-State mineralization.

Prospecting in the area is done with churn drills, pits, shafts, and adits. At present the U. S. Bureau of Mines has three drills operating in the district, under the direction of Louis E. Briechta, whose office is at Yellville. These drills are now working in the Rush Creek area.

The Arkansas zinc deposits have been handicapped in the past by the indifferent market for oxidized ores, which have composed the principal output. However, if the war continues for a few more years, it seems likely that the anticipated dearth of zinc concentrates will require that more attention be paid to the Arkansas deposits.

There can be no doubt that Arkansas has an assured future in regard to its diverse and abundant non-metallic minerals. However, one could hardly ask for a more puzzling problem than to pass on the future of Arkansas metalliferous deposits. Respecting the status of the bauxite, the abundance of which is unquestionable, albeit generally at depth or of low grade, it is natural to assume that the great revival of activity is essentially a "war baby" and that the restoration of full access to foreign reserves will kill off most of the present productivity. Foreign reserves are spoken of as enormous and of high grade. However, before being too hasty in condemning the future of Arkansas bauxites, it would be well to take into account that these foreign reserves were so described in terms of a pre-war rate of utilization. Collectively the belligerent nations have built up an aluminum plant capacity of roughly ten times that of pre-war days, and a considerable portion of the new capacity will probably be utilized after the war. If we undertake to draw on the world's high-grade bauxite reserves at anything like ten times the pre-war rate, those presumably abundant reserves may turn out to be only a few years' supply, and we may be forced to turn to lower-grade sources of aluminum. In such an event present knowledge indicates that low-grade bauxites will take precedence over aluminous silicates.

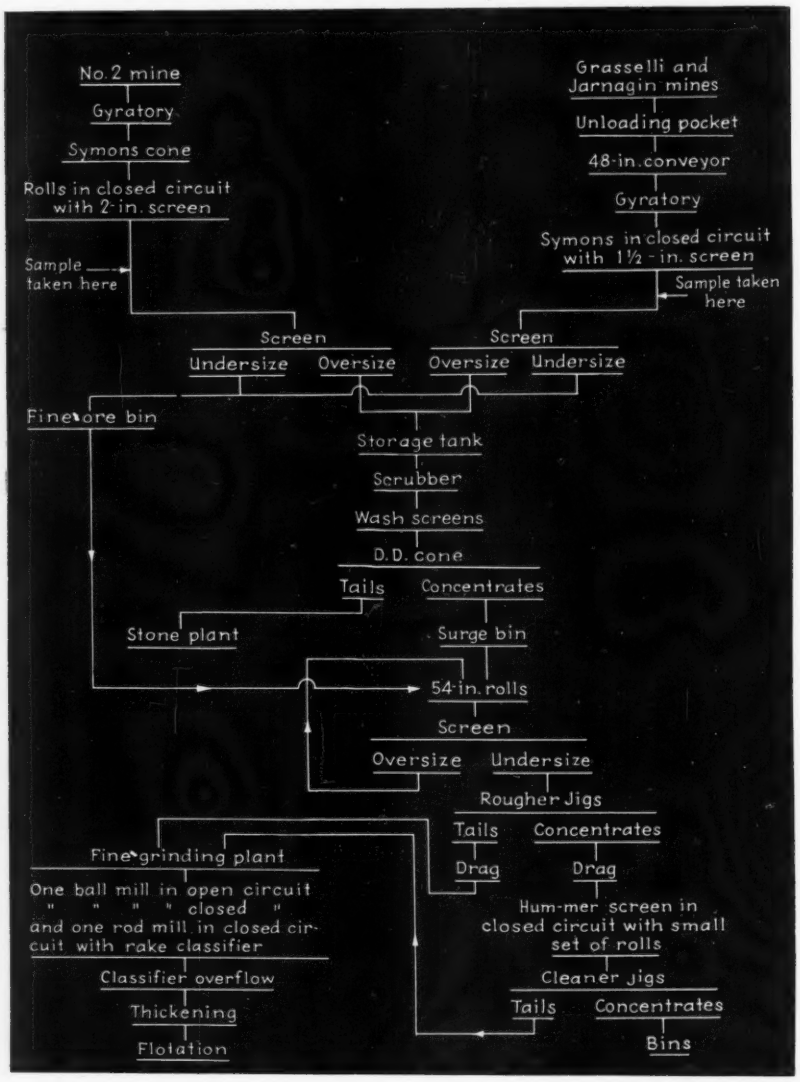
In regard to other metalliferous minerals, the nature of ore deposits scattered over Arkansas indicates that at least the northern and western halves of the State have experienced igneous intrusive activity resulting in widespread ore deposition. Almost every mining man who visits Arkansas is struck by the great number of prospects and the enormous aggregate tonnage of ore minerals, as well as by the circumstance that all this abundance has never supplied the basis for a single ordinarily permanent and profitable mining operation. Nevertheless, that such a breadth and abundance of the sources, structures, and host conditions conducive to ore deposition have not produced some valuable orebodies, seems impossible. In my opinion they exist, although they may be at depth or well concealed. The question is, how to find them. Therefore, I personally hope that the means will be found of carrying forward development of what is known, as the best route to uncovering the unknown.

D. D. Cone at Mascot Gets Coarser Feed

Over half of tonnage now discarded at outset

AMONG THE CHANGES made in milling practice at the concentrator of American Zinc Co. of Tennessee, since the flowsheet employing the differential-density, or sink-and-float, process was described in *E.&M.J.*, July, 1940, the most important has been an increase in the size of the feed delivered to the differential-density cone from minus 1¼ in. to minus 2 in. This change has grown out of the current practice of selling the deslimed reject of the cone, in the form of commercial stone and sand products, after screening and sizing it with or without crushing. It developed that there was a market for the coarser material, so a screen with 2-in. opening was substituted for the one previously used in closed circuit with the rolls crushing the No. 2 mine ore, which constituted the bulk of the tonnage. The resulting loss of metal in the cone tails is negligible. On the other hand, the D. D. cone is now rejecting as waste 80 to 82 percent of the ore fed to it, this amounting to over half of the total original mill feed.

Minus 2 in. seems to be the limiting size, according to the staff, because (1) it would be difficult to wash the medium from coarser rock; (2) coarser pieces of rock would plug up the bottom opening of the concentrate air lift and would call for constructing a larger cone, necessitating in turn an increase in tonnage; and (3) coarser fragments would increase the wear on the bucket elevator and conveyor.



Another change is that instead of grinding the galena medium in a ball mill, as before, for the differential-density separation the company now grinds to minus 2 mm. only, using a slow-speed hammer mill. This reduces loss. The company mill men likewise clean the medium differently: previously, to maintain viscosity they had been using three large Deister tables, splitting the dirty medium on two of them and cleaning on the third. Now they screen out the plus-100-mesh sand and clean it on a small Wilfley table. (A vibrating screen was installed, but an old, trough-like jigger screen appeared to be preferred.) The minus-100-mesh material goes to the three Deister tables as before. There is more of the coarse sand, plus-100-mesh, than before, owing to the increase in the size of the feed sent to the D. D. cone. This is attributed to a chipping action on the big pieces. The medium used comes partly from the Joplin district and contains some sphalerite. The loss of medium is about ¾ lb. of PbS per ton milled. Some of this is recovered in the tailings pond.

A third change involves the substitution of a cylindrical scrubber for the drag washer that precedes the washing screens ahead of the D. D. cone. The flowsheet embodying this change is shown. The scrubber, which is 6x20 ft. in dimensions and was supplied by Lippmann Engineering Co., Milwaukee, is intended to remove the fine particles of sphalerite and dolomite adhering to the large pieces after screening. It consists of a steel shell punched with ⅜-in. round holes for the last two-thirds of its length and having, as lifters, eight cast-iron flights, each 2½ to 3 in. high, around the inside at equal intervals. It is lined throughout with chilled-iron liners. The scrubber fines join the combined slimes from the plant that are sent to a Dorr thickener and then to flotation. Incidentally, substitution of this scrubber for the drag washer has saved 1,500 ft. of 24-in. conveyor belting per year.

American Zinc Co. of Tennessee, which is a subsidiary of American Zinc, Lead & Smelting Co., is operating three mines in the State. These are the Mascot No. 2, which yields half the tonnage of ore; the Grasselli, which contributes 30 to 40 percent; and the Jarnagin, from which comes the remainder.

Prospecting for new ore is under way. The company has nine churn drills and three diamond drills in the field and two diamond drills underground. Holes put down in the field are being drilled to depths of 300 ft., 600 ft., and 1,100 ft. respectively. Holes already drilled are classified as blanks; ore holes showing 10 ft. of

(*Continued on page* 59)

Mining and Washing Kaolin in Western North Carolina

Harris Clay Co. is the largest operator in the State—Mica is a byproduct—Operations of Carolina China Clay Co.

The Sparks mine of the Harris Clay Co., in Mitchell County, N. C. Mining is seen under way with a ⅝-cu.yd. shovel and 2½-cu.yd. trucks

A. H. Hubbell
Associate Editor

ONE of the outstanding producers of kaolin, or china clay, in this country, and the most important one in North Carolina, is the Harris Clay Co. Its properties are in Mitchell and Avery counties, in the mountainous western section of the State, and the head office of the company is in Dillsboro, N. C. Operations in the Spruce Pine area are carried on from the Spruce Pine office. C. J. Harris, of Dillsboro, N. C., is president of the company. Fred E. Smith is operating manager.

The company started its kaolin mining operations in Jackson County, N. C., in 1888. Today it has three plants of its own, including the Lunday plant, which is of modern design and equipment, as described in *E.&M.J.* of July, 1937, p. 341; the Sparks plant, which takes its name from the Sparks, or Dickey Thicket mine; and the Spruce Pine plant—all in Mitchell County. In addition, the company acquired a lease in June, 1941, on the new and notable mine and plant of Kaolin, Inc. (described in *E.&M.J.* of July, 1941), soon after the latter had begun to operate. The Harris company also holds under lease the Gusher Knob property, in Avery County, on which there is a large deposit of kaolin which has never yet been worked.

According to Mr. Smith, the crude china clays of the district run up to 20 percent in kaolin content, averaging 12½ percent. About 90 percent recovery is made at the Sparks plant. Recovery at the Lunday plant is 96 percent. The Sparks clay has a lower firing shrinkage and higher absorption than the Lunday clay.

The Sparks or Dickey Thicket mine was the first pit in this area to be worked by shovel. There, the clay was formerly mined hydraulically. The mine was opened in 1938, when stripping was begun. At present the pit is about 500 ft. from northwest to southeast and about 175 ft. wide. A dark-colored slate horse cuts the deposit at the northeast end. Overburden has averaged 6 ft. in depth. The thickness of the clay has been about 60 ft. on an average. At the southeast end it is not so thick as at the opposite end. Thus far the clay has been worked in three benches. About 10 ft. of kaolin still remains in the bottom.

The bottom of the pit is soft and in consequence the shovel is carried on timber mats, and the road used by the trucks that transport the clay is floored with mats. These are made of hickory and oak boards about 10 ft. long and from 3x6 in. up to 3x12 in. in cross-section.

Digging is done with a full-revolving, caterpillar-mounted Northwest shovel powered with a 95-hp. Ford V-8 gasoline motor. The dipper is of ⅝-cu.yd. capacity. Three 1½-ton trucks, with 2½-cu.yd. bodies, serve the shovel. Two are Chevrolets and one is a Ford. The truck-haul out of the pit to the plant is approximately an eighth of a mile.

At the Sparks plant the trucks dump over the side of a 600-ton open bin, from which the crude clay is sluiced into the boot of an elevator with water supplied at the rate of 3,060 gal. per hour. Sodium silicate is added as a dispersing agent at this point to put the clay in suspension and keep it there. The elevator delivers to an inclosed blunger having a revolving shaft set with teeth 2 ft. long and 1½ in. square in cross-section and set 4 in. apart. The shaft turns at 450 r.p.m., driven by a 40-hp. G.E. motor.

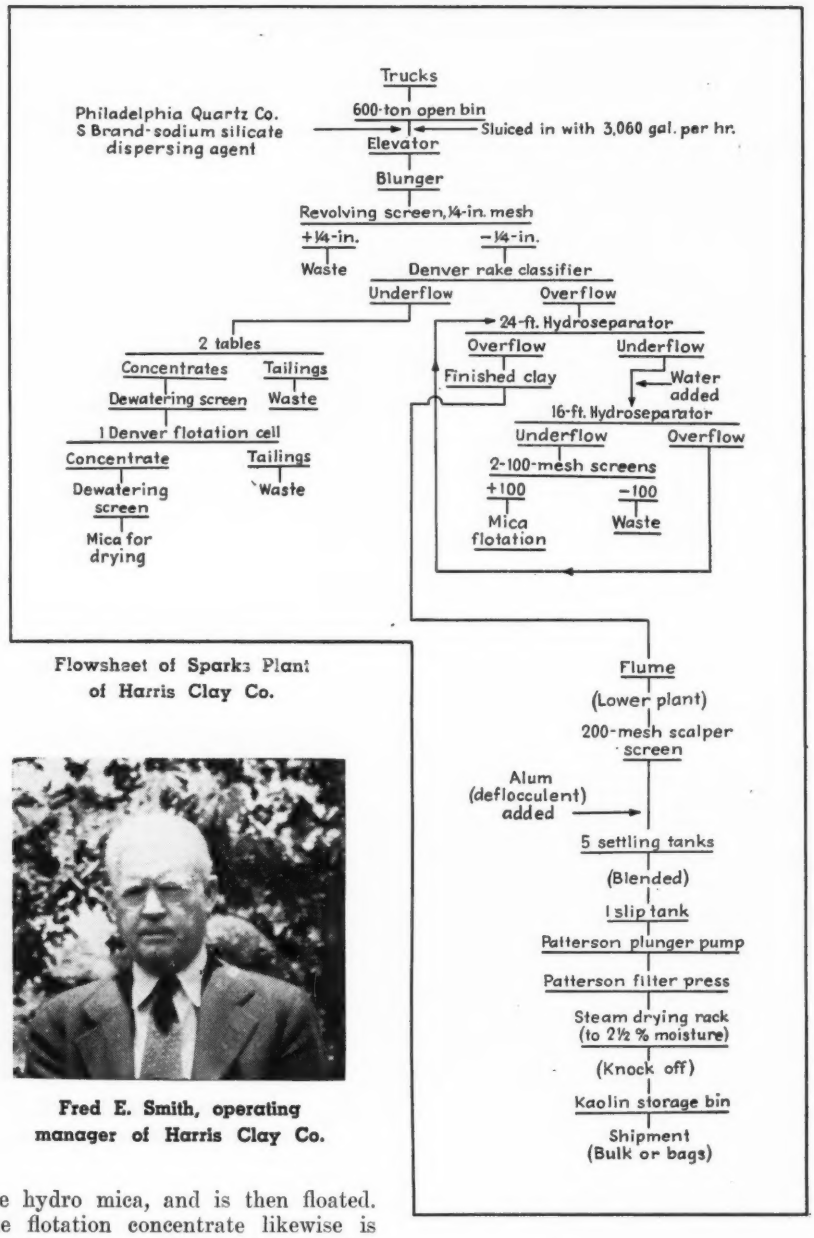
From the blunger the clay-water suspension plus the coarser material it carries goes to a ¼-in. mesh revolving screen. Oversize is sent to waste. The minus ¼-in. mesh material is sent to a Denver rake classifier. The underflow goes to tables and the overflow to a 24-ft. hydroseparator. The overflow of the latter is finished clay.

The hydroseparator underflow is sent to a 16-ft. hydroseparator, where it is rewashed, the overflow from this operation being returned to the 24-ft. hydroseparator. The plus-100-mesh fraction of the underflow of the smaller hydroseparator is sent to froth flotation, and the minus-100-mesh fraction in the underflow goes to waste. Tails of the rougher cells go to waste. The froth is washed in other cells to clean it. Here again the unfloated fraction is sent to waste. The overflow from the cleaner cells is finished mica.

Overflow from the 24-ft. hydroseparator containing the finished clay is passed through a 200-mesh scalping screen, alum is added as a deflocculent, and the clay is settled in tanks, of which there are five. It is then blended from all five into one slip tank. From this it is pumped by a Patterson plunger pump through a filter press of the same make. The cakes are dried to 2½ percent moisture on steam-heated racks, from which they are knocked off into a car and sent to a storage bin.

Shipments of kaolin are made mostly in bulk, although some customers get their orders in bags. The plant's capacity is considered to be 1½ to 1¾ tons of finished clay per hour over a 24-hr. day.

Returning now to the tables that treat the rake classifier underflow, the visitor notes that the table concentrate is dewatered on a screen to remove a little of the clay and the very



Flowsheet of Sparks Plant of Harris Clay Co.

Fred E. Smith, operating manager of Harris Clay Co.

fine hydro mica, and is then floated. The flotation concentrate likewise is dewatered on a screen, yielding a finished mica for drying. The table tails are wasted. Undersize from the final dewatering screen after flotation is also sent to waste.

In the flowsheet as described, the kaolin, it is seen, is taken out of the circuit as the overflow of the 24-ft. hydroseparator. Mica, however, is recovered by flotation at two separate points. These are:

1. The plus-100-mesh material from the 16-ft. hydroseparator underflow. This oversize is put through a four-cell MS machine and is rewashed in a three-cell Denver Sub-A machine driven by a 7-hp. motor. The concentrates are dewatered on a screen. Tails from each cell are sent to waste.

2. The table concentrates, after being dewatered, are floated in a single Denver Sub-A cell. A liberal cut on the tables is taken of the clay balls with mica. The cell requires 3 hp. It is floating 55 percent +20-mesh material successfully. Previously the company had been told this could not be done and it had been wasting the material.

Concentrates from the two mica flotation sections go to a bin containing 60 percent moisture. They are shoveled by hand into a truck and taken to the Spruce Pine mica-drying plant.

All mica produced by the Harris company is used for roofing.

Three men are required in the Sparks plant per shift: one on feeding, one on clay operations, one on mica recovery. In addition, two men, on day shift only, haul mica to the Spruce Pine plant for drying. Total, 11 men. The plant is run on a six-day week, 24 hr. per day, or from 7 a.m. Monday to 11 p.m. Saturday. All men get 48 hr.

At the Lunday plant the same flowsheet is used as that described by Mr. Grout in *E.&M.J.*, July, 1937, save that the classifier overflow is now screened at 60-mesh and sent directly to flotation. The underflow from the hydroseparator (which is of Dorr make in this plant) is treated on tables, and the middlings are sent to flotation. Plant capacity is 1¼ to 1½ tons of clay per hour.

This plant is operated on three shifts, except that pressing and filtering are done on two shifts only. There is storage capacity for 1,000 tons of clay in the big thickener that supplies the filters.

The mine at Lunday is equipped with one shovel belonging to the company, which pays the two operators. Trucking is done by a contractor who owns the trucks and pays the driver.

The force employed at the Lunday unit consists of three men at the mine on two shifts, there being two drivers also on the trucks supplied by a contractor; and 14 men on each shift at the mill. Job Thomas is foreman and S. B. Cannon, engineer.

Kaolin, Inc.'s mine and plant are now operated under the name of Harris Clay Co. Procedure in the mill is practically the same as described in *E.&M.J.*, July, 1941, save that the recovery has been improved. The mica flowsheet is likewise little changed. The waste from the blungers is tabled now and the middlings are sent to flotation.

Salisbury granite mill liners and grinding media come from Harris Granite Quarries, also belonging to the C. V. Harris interests.

Operations of Carolina China Clay Co.

Also in Mitchell County, across the North Toe River from the Deer Park group of feldspar mines, are the kaolin and mica plants of the Carolina China Clay Co. The mine that supplies the plants is a few hundred feet back from the river.

W. F. Deneen is president of the Carolina company. Harry Bailey is vice president and W. B. Deneen, secretary-treasurer. The last named, a civil engineer formerly with the Clinchfield Railroad, which passes through the region, manages the operations at mine and plants. The following data respecting them were largely supplied by him:

This mine has been opened for 40 years. Edgar Brothers started it. Harris Clay Co. bought them out and in turn sold to the Carolina company in 1934. The latter company had been operating a mine on Bear Creek 3 miles away, and, having worked it out, bought the present property.

Here there are really two pits, the old one and another one immediately next to it that was started only last year. The perimeter of the former is irregular, inclosing about three acres. Before it was stripped by hydraulic means the overburden was 6 to 30 ft. deep. The depth of the clay has been approximately 50 ft. The bottom, which is granite, is exposed in the pit,

which, allowing for the stripping, thus has a depth of 60 to 80 ft. The clay is of good quality, but the yield is low —about 7½ percent. Mica also is recovered from the pit.

Mining is done hydraulically. At the most, two 2½-in. hoses have been employed, using water under 30- to 40-lb. pressure. This is supplied by an 8-in. single-stage centrifugal pump from a 2,500-gal. tank, into which the water from Little Bear Creek is delivered by a wooden flume at a grade of 22 in. per 100 ft. The pump is approximately 1,100 ft. distant from the point where the water line, of 4-in. pipe, enters the mine. At the time of the visit two hydraulic hoses (not guns or monitors) were in service.

The bottom slopes so that the ditch running from the hose shelter, where the man engaged in mining is stationed, has a grade of about 10 percent downward to the pit of the bucket elevator, 300 to 350 ft. away, which lifts the clay-water mixture out of the pit. This elevator is 70 ft. high center-to-center. The pit in which it sits is 35 ft. deep and 24 ft. in diamter. This pit was previously dug for the elevator, which was then erected in it. The elevator is run by a 10-hp. motor—somewhat too much power for the task.

The adjacent pit was started in 1941. Here about an acre has been cleared and stripped with a Sauerman tower scraper having a two-drum hoist powered by a 40-hp. Lambert motor and a 1-cu.yd. Crescent bucket. The clay underneath is assumed to be about 60 ft. deep, judging from other beds in the area. It has not as yet been drilled, water having been encountered.

Mining here is also done with a hose, the clay-water mixture running to a bucket elevator that is 30 ft. high center-to-center. This elevator is being allowed to dig its own pit in the manner in which caissons are sunk, according to Mr. Deneen. The elevator must be kept plumb while being sunk. As mining progresses, it will be lowered every six or seven days. Elsewhere the rate of lowering has been as much as 6 to 8 ft. in one day. It had already been lowered here 3 ft. since starting work at the time of the visit. The elevator has a base approximately 14 ft. square. The sluicing is so conducted as to have the clay bottom slope properly into the elevator pit.

Clay-water mixture is discharged by the elevator into a wooden flume which takes it to the clay plant a few hundred feet away down the slope and nearer to the river. It first enters a tank containing a so-called sand wheel classifier which has buckets around its periphery. The lifting action of the revolving wheel is intended to disintegrate the mixture and separate the coarser, heavier material, and also the fine sand, from the water and the clay. The coarse material discharges from it to a blunger, which gives it further washing, and then passes to a second blunger for similar treatment. Fine sand and gravel from the sand wheel enters the second blunger directly, bypassing the first blunger.

The discharge from the second blunger, together with the water and clay from the sand wheel, now enters a second sand wheel classifier, thus recombining all the elements in the original feed but in a well-disintegrated state.

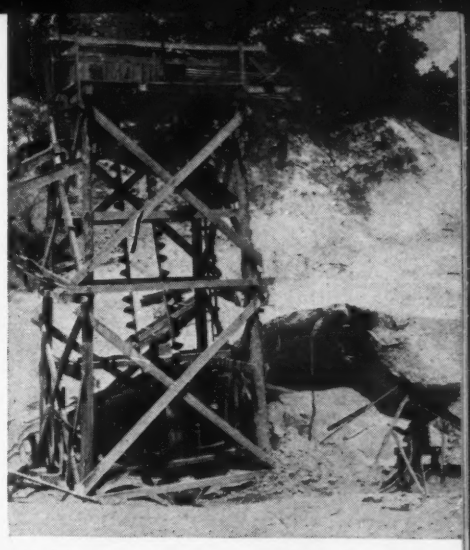
In this second sand-wheel classifier the coarse sand and mica are now readily separated from the rest of the mixture and go to the mica plant. The remainder of the material discharged by the classifier goes to a settling box where the fine sand and mica settle out and also are delivered to the mica plant.

The clay-water overflow from the settling box now flows through a series of settling troughs in which the remainder of the sand and mica retained is supposed to settle out. These settlings also go to the mica plant. Thus mica plus sand enters the mica plant from three different points.

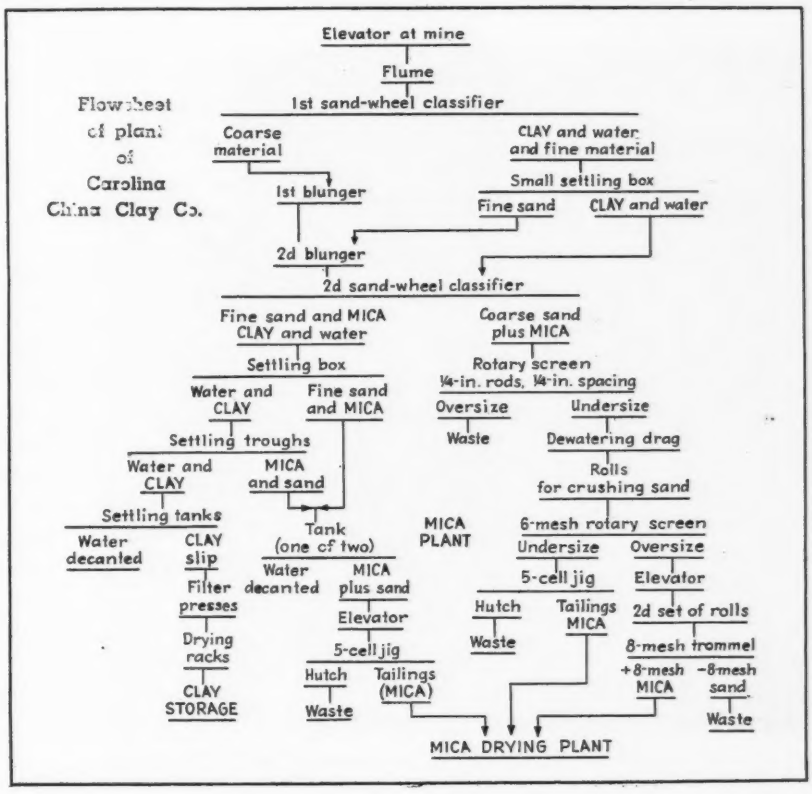
Feed to the mica plant, as already indicated, consists of the coarse sand and mica from the second sand wheel classifier and the finer settlings from the settling box and troughs.

Settlings from the second sand-

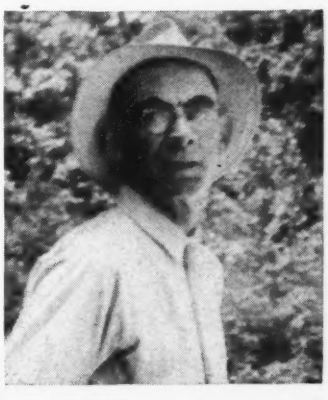
(*Continued on page* 65)

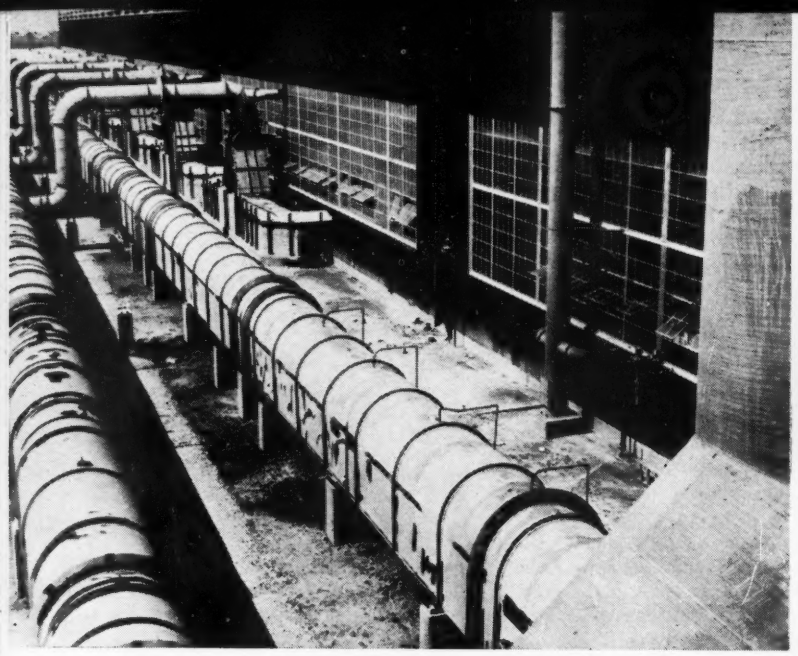


At the mine of Carolina China Clay Co. The bucket elevator, 30 ft. high, raises the clay-water mixture to the flume that takes it to the washing plant

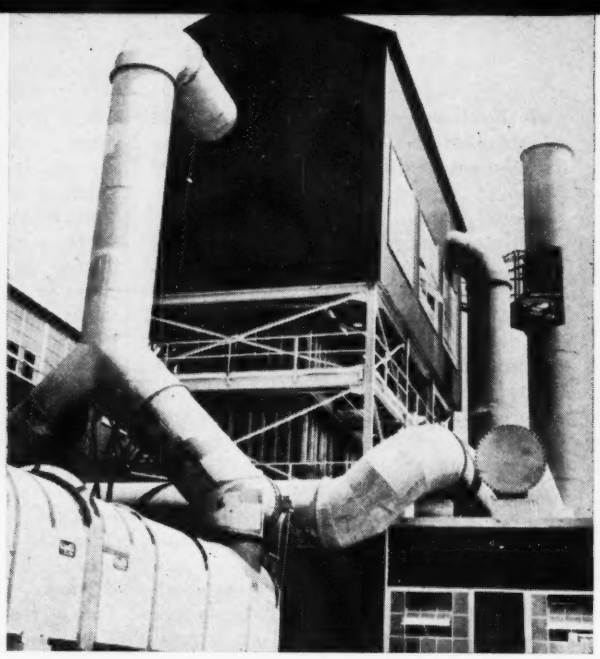


W. B. Deneen, secretary-treasurer of Carolina China Clay Co.,





Flues carry metal fumes from furnaces to precipitator



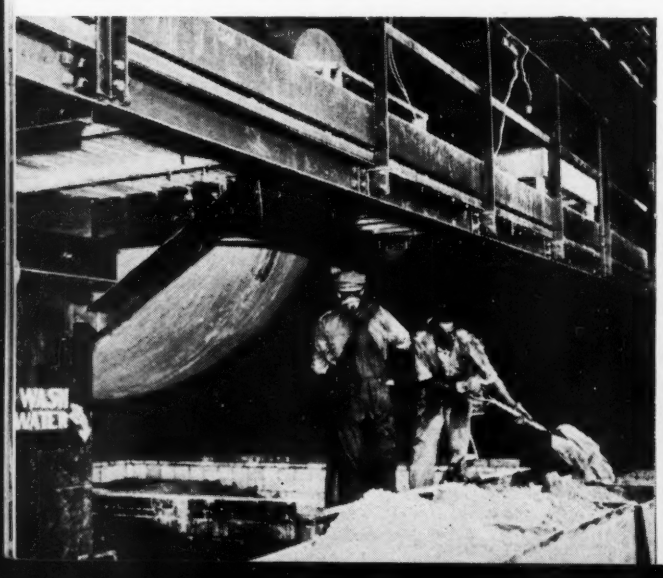
Cottrell 65,000-volt precipitator cleans furnace gases

Emptying bags of Bolivian tin concentrate onto the crushing plant conveyor belt

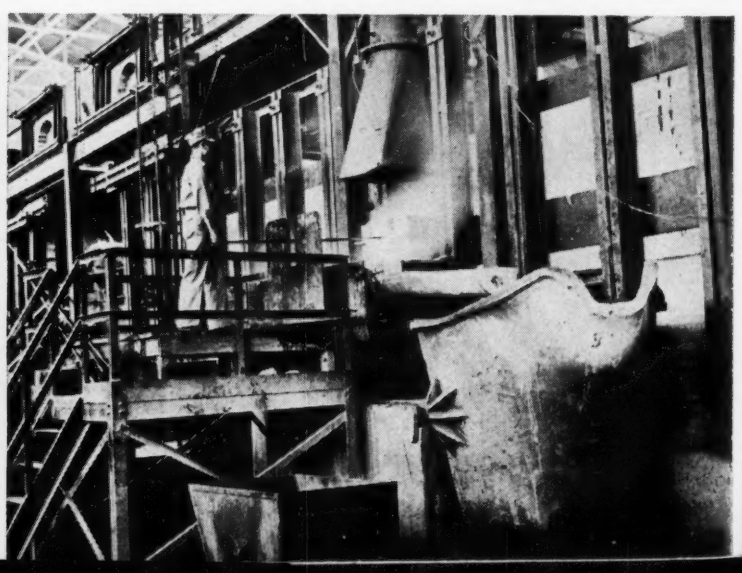
United States World's Finest

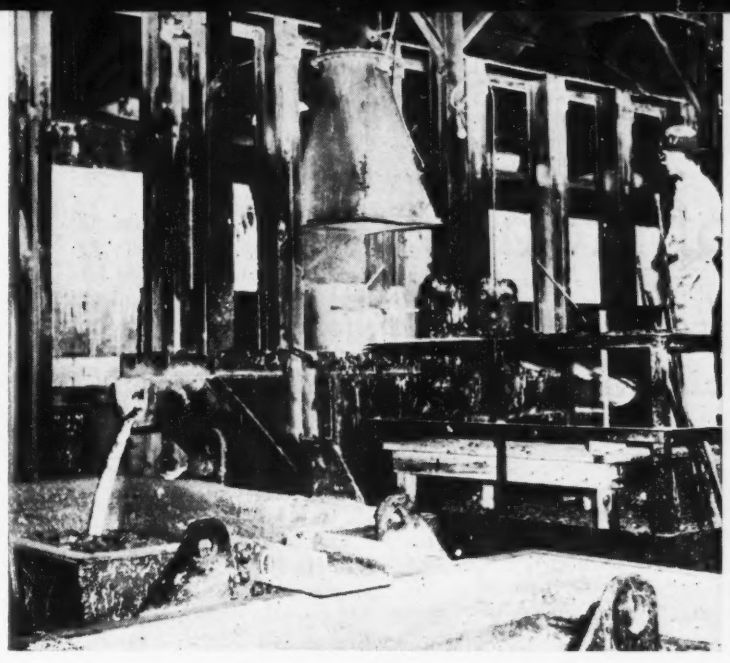
ON APRIL 5, 1942, the first tin was produced at a new tin smelter located in a Southern city of the United States. Views of the plant and process are shown in the accompanying illustrations from official photographs released by the Office of War Information. Dutch experts built the smelter for Defense Plant Corporation and operate it for Metals Reserve Company. Raw material is Bolivian concentrates imported under a government contract signed Nov. 4, 1940. The plant was completed in record time—14 months after agreement was reached for its construction and seven months after building actually began. It

Removing ore from acid leaching treatment prior to smelting

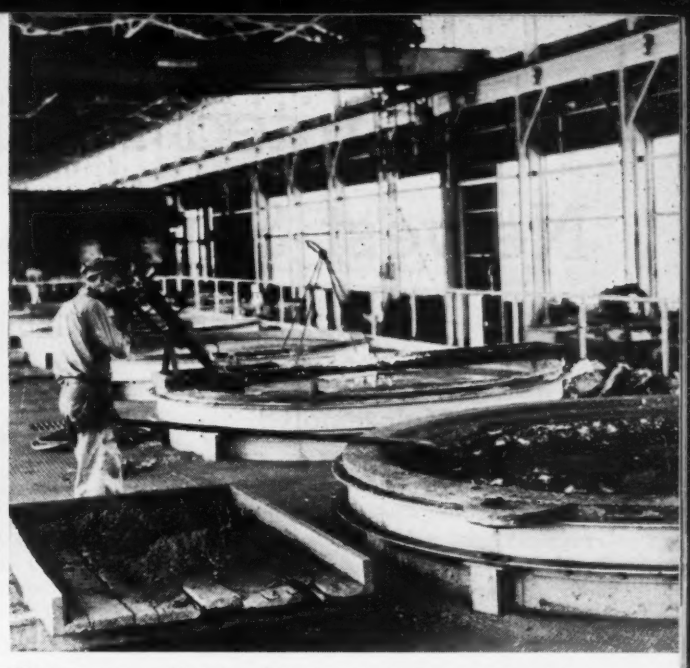


Tapping slag from reverberatory furnace for re-treatment





Tin is drawn off from furnace for transfer to drossing kettles



Molten tin is purified by skimming in drossing kettles before casting

Now Operates Tin Smelter

is said to be the finest of its kind in the world and, with planned extensions, it will also be the largest. It is the only tin smelter in the United States; indeed the only one of consequence in the Western Hemisphere. Although built as a war measure, the site was chosen with a view to continuing tin smelting in this country after the war. Already operating in excess of the capacity for which it was originally designed, it will be enlarged to handle the entire tin-ore production now available to the United Nations. *E.&M.J.* is indebted to the OWI for these official photographs by Hollem.

Tin is cast in 80-lb. pigs on the casting floor below drossing kettles on balcony at

Close-up of casting operation where tin at 650 deg. F. is poured into molds

Stacking pig tin produced from Bolivian ores. Each bar is worth about $41.60

The United Nations' Newest Source of Iron

Geology, reserves, and plan for exploitation of Brazil's huge Itabira hematite deposits

A. Malozemoff
Consulting Engineer
63 Wall St.
New York, N. Y.

▶ PRESENTED HEREWITH *is the second and concluding installment of Mr. Malozemoff's discussion of the Itabira iron ore deposits of Brazil. In this section he deals with ore reserves, mining methods and costs, and the probable value of the ore in the United States, including a comparison with mining costs and prices established for ores of the Mesabi range. In the previous installment, published in last month's E.&M.J., Mr. Malozemoff took up the economic background of the exporting and importing of iron ores, and discussed the geology and composition of the various types of ore found in the Itabira deposits.*

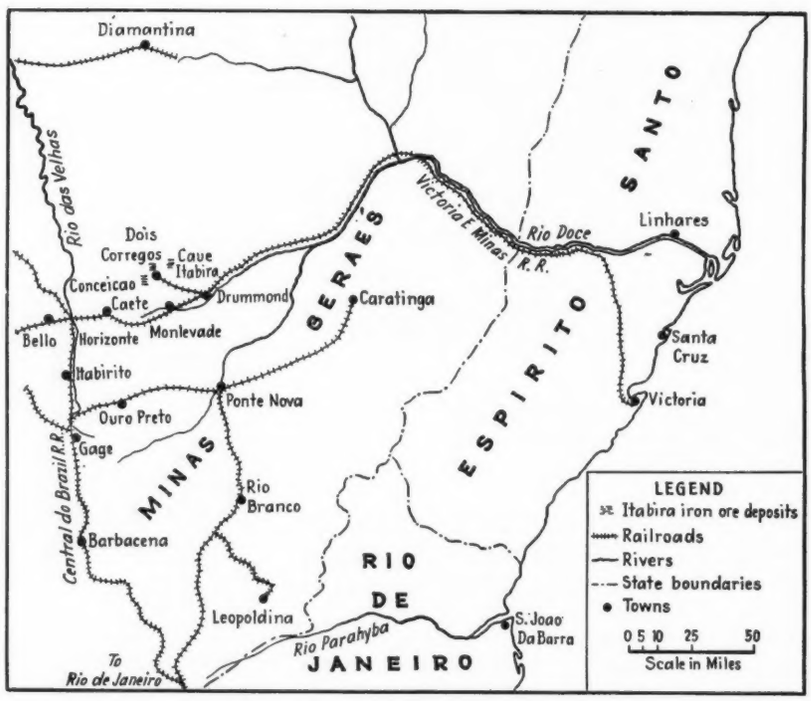


Fig. 1 . . . Map showing location of Itabira iron ore deposits and route of railroad to the port of Victoria

IT IS DIFFICULT to express in figures the vast reserves within the Itabira district. Mr. Merriam and C. K. Leith estimated the ore reserves of the whole Itabira district at more than a billion tons. It is not unreasonable to state after having seen the exploratory work and having made a geological examination of the property, that even at the high rate of production of 10,000,000 tons per year these deposits will last for generations to come. Two essential methods of exploration have been used at the Itabira iron deposits to explore the iron-ore reserves: tunneling and diamond drilling. As has been indicated, a great amount of tunneling—about 11 km.—was done on the property, by means of which about 173,000,000 metric tons of hard hematite ore were thoroughly proved. Besides, great amounts of "canga" and "jacutinga" were established by this work in the upper levels of the deposit. The lower strata of the deposit, below levels which could be explored by tunnels, have been attacked by diamond drilling, but because of the great quantity of the "soft" ore encountered, which is a fine hematite powder, the diamond drilling had to be abandoned. It is clear, therefore, that the explored portion of the deposit represents merely the upper reaches thereof, and hence affords only a fractional picture of the whole.

In my opinion, any attempt to express even in approximate figures the extent of the deposit of the Itabira district is nearly futile, because only an unknown portion of the whole of this enormous deposit has been explored by tunneling. The most conservative and the least misleading statement would be that the Itabira district has in evidence not less than 1,000,000,000 tons of good iron ore of at least 50 percent iron in grade, of which about 80 percent would be hard ore, "canga," and soft ore, containing 65 percent iron or more. It is probable that actual reserves will prove double or more of this figure. I regard it as quite probable that the discontinuous outcrops visible now, on the basis of which the present estimates of reserves are calculated, will prove to be only parts of a continuous deposit of iron ore at some depth below.[12] The vast blankets of "canga" probably hide under them even vaster quantities of hard and soft ores, which will be revealed only when the development work reaches these levels. Consequently, in evaluating the Itabira deposit, it is just as wrong to limit the estimate of total reserves to 1,000,000,000 tons or any other more conservative figure arrived at by some geologists, as it is to cite the astronomical figures advanced by others.

Mining Conditions—The Itabira deposits of iron ore lend themselves to cheap mining methods, and for generations to come the ore may be mined by open-cut methods. The deposits occur as hills, almost without overburden, and for a very long time virtually no work need be done at levels lower than the average of the countryside.

Technical problems at the Itabira mines are, however, fundamentally dif-

[12] The eminent iron ore authority, Prof. C. K. Leith, in his report on the Itabira iron ore district of April 10, 1933, days: "There is good geological reason for believing that ore is continuous, though varying in thickness, hardness, and grade, for the entire zone; but large areas are covered by canga and soil, and the ore is shown on the map only where it projects through this blanket."

ferent from the problems of the mines in the Lake Superior region in the four following respects:

Mesabi versus Itabira

1. There is almost no overburden, and there will be no stripping operations of any importance at the Itabira mines, whereas at the mines of the Lake Superior region the overburden is an increasingly difficult problem and an increasingly heavy item of costs.

2. The problem of moving the heavy ore is, at Itabira, entirely different than in the open pits of Mesabi. At Mesabi all the ore must be hauled up to the surface from a vertical depth of as much as 400 ft., but at Itabira, for generations, the problem will be to move the ore down from the hills. This is an enormous advantage of the Itabira deposits, which will be naturally reflected in the cost of its exploitation.

3. Against these great advantages, there is a disadvantage in the Itabira deposits in the fact that practically all the ore is hard to break, whereas most of the ore worked by open-pit operations in the Lake Superior region can be negotiated virtually directly by a power-shovel dipper. This means that drilling and blasting, which are relatively negligible items of cost on the Mesabi range, will be heavy items of expense at Itabira. Also, very little crushing is done in the majority of the Mesabi mines which produce the so-called direct shipping ore, but at Itabira all the ore produced will have to be crushed on the spot to about 9 inches.

4. On the other hand, the mines in Brazil can be worked practically under the same technical conditions all the year through, whereas the open pits of the Lake Superior region have only about six months' true working season. During the winter the companies have a difficult problem in preserving their organizations intact and in conducting stripping operations under adverse conditions.

The logical point for commencing the exploitation of Itabira iron-ore deposits is Caue peak, shown on page 56 of the issue of December, 1942. Its orebody is the one which has been best prospected and studied. It is directly adjacent to the terminus of the railway. It is also the greatest known hard-ore mass, and the easiest to equip, develop, and mine.

Caue deposit will have to be mined gradually from the peak down to the lower levels, for a long time above the level of the railroad line. Open-cut mining will have to be conducted in benches, several methods of which could be applied to the Caue conditions. One of the most suitable, planned by the writer in 1940, is represented in Fig. 2. The height of benches may be considerable, as the ore is hard and will stand well. Of course, only experience may show the optimum height and width of the benches, but it was planned to start the operations with the benches 40 ft. high and a minimum of 75 to 80 ft. wide.

Though most of the ore looks extremely hard, my experiments and experiments conducted by Mr. Watson of Bucyrus-Erie Co. proved that even the hardest portion of the Caue ore deposit can be drilled by modern churn drills. It was considered that Bucyrus-Erie drills might be used for this purpose, and that large diameter holes (6 to 9 in.) could be spaced at about 25 ft. for effective blasting. However, only actual experience may demonstrate the optimum location and spacing of holes and the nature of explosive charge to give best results. It was estimated that at least 900 tons of ore could be prepared by the work of one churn drill on an 8-hour shift. Electric blasting in combination with Primacord fuses was considered. It was apparent also, in view of the hardness of the ore, that quite a lot of secondary blasting would have to be done. It was planned to use for this purpose 45-lb. jackhammers working on a small electrically driven compressor that would be installed near Caue peak.

Ore-handling Method

Loading of the broken ore onto trucks, as was contemplated, could be done most advantageously by an electric heavy-duty (54-B Bucyrus-Erie) shovel with Ward Leonard controls, on caterpillar mountings. The shovel should be fully revolving, and the capacity of the dipper, in view of the extreme heaviness of the ore, it was thought, should not exceed 2.75 cu.yd. Theoretically, such a shovel, under Itabira conditions, would have a capacity far in excess of 5,000 tons of ore per day. However, as the loading capacity of a shovel largely depends on the ability of its operators, the use of two shovels was contemplated for a yearly initial production of 1,500,000 tons of ore.

Many methods of hauling the ore from the benches to railway loading bins have been studied. Cableway, gravity incline, and belt transportation were considered. The comparative studies, however, indicated that the most convenient and flexible method would be to employ large diesel trucks, now so much in use in the open-cut operations in the United States, to haul the broken ore from the shovels to the railway loading bins. The road from the mining benches to the railway loading station, about two miles long, may have, over the larger part of it, a grade much below 10 percent, with short distances over which a higher grade could be allowed. At the benches the road is at an elevation of 430 meters, and the discharging point is at about 90 meters (from the zero point). The difference in altitude is therefore about 340 meters over a total distance of about 3,400 meters. The existing road was built for the profitable hand production of ore, but a considerable part of it could be used as is, and only some stretches of it would have to be smoothed down. The roadbed is very stable and smooth, composed mostly of "canga," and its maintenance in a perfect condition, with fine iron ore as cover, I expect will not be difficult.

The best units for this transportation would appear to be 15-ton diesel side-dump trucks with full 15-ton side-dump trailers. The haulage would be down hill practically all the way on the road, and most of the haulage work thus would be done under gravity force. Also, the trucks and trailers would require good and stable mechanical brakes and on the trailers it may be useful to distribute braking on more wheels. The greatest expense of diesel fuel would be thus for driving empties upgrade from the railway loading station to the working benches. The construction of trucks and trailers has been discussed with manufacturers, who offered designs which appeared satisfactory. It was calculated that a unit shift (15-ton truck with 15-ton trailer) would handle, over the distance of about two miles, at least 300 tons at a cost per ton of about 3.4¢ U.S. currency.

The building of simple wooden ore bins at the railway stations has been suggested. These bins would have a capacity of more than 6,000 tons and would be equipped with a first unit of the crushing plant, of the capacity of 400 tons per hour. These bins could be easily extended westward, and the second and third batteries of bins could be built at comparatively low cost. The ore would be loaded on the railway cars from the bins by gravity. The crushing, it was contemplated, would depend upon the contract with the consumers of the ore, and the bins would be built in such a way that the possibility of installing screening and eliminating fines could be arranged, if necessary. A more advantageous arrangement, using conveyor belts for loading the cars, could be found if certain restrictions on ownership of the land can be overcome.

Power Supply

Several methods of building up a hydroelectric power plant for mining operations near Itabira were considered. There is a water fall near the station of the Victoria Minas Railroad at Antonio Diaz, about 60 km., as the crow flies, from the Caue mines, where, it was estimated, about 20,000 kw.

can be generated. However, because building the dam and power plant at the Antonio Diaz Falls would require large expenditure of capital, it was considered that, for the initial operations on a comparatively small scale, about 1,500,000 tons per year, such a plan would be too ambitious. Probably the best solution of the power problem for the first stage of the development of the Itabira mining operation would be to reach an agreement for buying electric power from the Companhia Mineria Electrica, which, at the time of my work, was building a large hydroelectric plant near Santa Barbara, about 35 km. from the Itabira mine.

The greatest problem in exporting the iron ore of Brazil to the international markets has always been the low carrying capacity of the existing railways in Brazil. Itabira iron-ore deposits had to depend for transportation of ore on the Victoria e Minas Railways connecting the Port of Victoria with the station of Desembrador Drummond, over a line of 560 km. This railway, as it can be seen from the map, follows the Valley of the Rio Doce and its tributaries, which is the only river cutting through the three ranges of mountains between the ore deposits of the Itabira Plateau and the Atlantic Ocean.

In 1940, 1941, and 1942, the line was extended right to the mines of Itabira, over an additional distance of 40 km. It was poorly constructed, however, and is full of humps and grades which preclude the possibility of using long, economical trains. The surveys made under my supervision proved, however, that a great improvement of the railway line can be made at comparatively small expenditure. Consideration of the problem indicated that the line could easily and quickly be improved to a uniform grade of 0.5 percent in favor of load, with a minimum curvature of 200 meters. Then after strengthening of bridges, trains consisting of 30 ore cars of about 40 tons' gross weight each could be handled with one locomotive of the Sante Fe type with 11 tons per axle. Further improvement of the road and a complete change of the line would apparently be justified only if the required production would reach more than 3,000,000 tons of ore yearly. Provided required improvements are satisfactorily made, the cost of rail freight from Itabira to the port of Victoria should be about $1 per ton of ore.

For prompt loading of ore boats at Victoria, I designed a series of ore bunkers and loading arrangements which since then, with certain modifications which I accepted, have been built at the Port of Victoria. The capacity of the loaders, it was projected, would be up to 1000 tons an hour. Handling of ore at the dock should cost about $0.05 per ton.

Economic Aspects—The preliminary estimates of the possible cost of mining at Caue mine, based on the method described in the foregoing, with a production of 1,500,000 tons of ore per year, were as follows:

Drilling	$0.06
Blasting	0.16
Power shovel operations	0.04
Haulage from the mine to the loading station	0.04
Crushing and loading	0.05
Administration and staff, accounting, etc.	0.06½
Maintenance of camp and roads	0.01
Miscellaneous and unforeseen	0.02
Total	$0.44½

A comparison of these costs with the average costs per ton of iron ore produced in the mines of Minnesota, from the years 1928 to 1942, should be of interest.

Comparison of Mining and Shipping Costs for Mesabi and Itabira Ore

	Mesabi Ore	Itabira Ore (Approximate)
Mining costs	$0.81	$0.45
Royalties	0.42	(maximum) 0.20
Taxes	0.72	0.20
Rail to shipping port	0.81	1.00
Dock handling	0.11	0.05
Water transportation	0.77	(see below)
Unloading charges	0.14	0.14
Interest, insurance and incidentals	0.05	0.05
Totals	3.83	2.09

The statistics presented indicate that not only mining costs, because of the much easier mining conditions, but also the cost of royalties and taxes, will give a very favorable position to the Itabira iron ore.

As to the water transportation of the Itabira iron ore to the probable ports of consumption in England and in the United States (Baltimore, Sparrow Point, or Houston) under the war conditons of shipping and of abnormal ocean freight rates, to guess what may be an acceptable normal figure for this item is naturally extremely difficult. I was inclined to assume a value equivalent to that met in shipping Chilean ore from the Tofo mines by the Bethlehem Steel Corp. for its plants in the United States. These costs were as low as about $2.50 per ton, including Canal charges, which, in the shipment of Brazilian ore, would not exist. Technical progress in building special ships for ore cargoes should also materially lower the cost of transportation. All factors considered, the total cost of the Itabira iron ore in the United States Atlantic ports may be expected to be about $4.60 per ton, against a $3.83 average cost of Minnesota ore per ton at the Lower Lake ports, from which very often ore is transported at a substantial cost to the consuming steel plants. For example, the charge from Lake Erie ports to the Pittsburgh and Wheeling district is $1.30 a ton; from Lake Erie ports to Johnstown, $1.45; from Buffalo to Sparrows Point, $2.09. These figures must be taken into consideration against the possible ocean freight charges on Itabira ore if we wish to make a just appraisal of the position.

These are the figures, however, on the matter of costs before any interest on capital and profits are considered. The prices at which iron ore is sold to consumers f.a.s. Lake Erie ports are a different matter. In 1937, 1938, and 1939, the Lake Erie base prices for iron ore were $5.25 for Old Range bessemer and $5.10 for Old Range non-bessemer. These are based on the following specifications: Old Range bessemer, 51.50 percent iron natural, 0.045 percent phosphorus; Old Range non-bessemer, 51.50 percent iron natural. These prices mean a price per unit; Old Range bessemer, about 10.2c. per unit; Old Range non-bessemer, about 9.9c. per unit. In April, 1940, these prices were lowered to $4.75 for Old Range bessemer, and $4.60 for Old Range non-bessemer, which would correspond to 9.22c. and 8.93c. respectively. There is, however, little doubt that under pressure of increasing demand, the prices soon will be raised to at least the 1937-1939 level.

If we accept the prices just quoted for calculating the possible price of Itabira ore in United States Atlantic ports, with the ore having an analysis of iron 68 percent, phosphorus, 0.02 percent, sulphur, 0.02 percent, silicate, 1.5 percent, the basic price at Sparrows Point and similar ports should be (as the Itabira ore is all bessemer), $6.94 per ton at prices of 1937-1939 and $6.27 per ton at the lower price of 1940-1941.

However, this is only a part of the story. The Itabira ore will be entitled to large premiums in accordance with the rules about price adjustments for iron ores. All ores containing less than 0.045 percent phosphorus command a premium, which, in an ore of 0.02 percent phosphorus, will be $0.35 per ton.

There will also be premiums for "lump" ore. Hard ores of high iron and low silica content, the finest examples of which are the Itabira ores, are often sold as "lump" grades. Such ore commands a premium, and the price per gross ton, delivered at rail of vessel at Lower Lake ports, is generally computed as follows: to the standard Lake Erie price for Old Range bessemer containing 51.50 percent iron natural, the premium should be added, then the sum be divided by 51.5 to obtain the value per unit of iron content, and this must be multiplied by the natural iron content of the lump ore.

If all the facts presented are taken into consideration, the selling value of the Itabira ore at the Atlantic ports of U.S.A. (like Sparrows Point)

obviously should be not less, even at the lower prices of 1940-1941, than:

Basic price for 68 percent iron....	$6.27
Phosphorus premium	0.35
	$6.51

As the probable cost at Sparrows Point for the Itabira ore may be estimated at $4.59 per ton, there is an ample margin not only to cover interest on capital investment, amortization, and depreciation, but also probably freight charges to move the ore to districts as distant as Pittsburgh.

The last-mentioned possibility may arise because of two reasons: (1) In view of the shortage of scrap and its high price, steel makers will have to consider using more and more ore in their open-hearth furnaces. Because of the extreme purity of the Itabira iron ores, which are the purest ores in the world, the Itabira "lump" ore may command a large premium as open-hearth material. From the economic point of view it must be borne in mind that a unit of iron in scrap costs usually not less than 20c. at the plant. With practically 70 percent iron, the Itabira ore, which represents a good open-hearth material, at say 11 to 12c. per unit at Pittsburgh, would supply a profitable substitute for scrap. An Old Range bessemer ore of 61 percent iron natural, at Lake Erie values, is being sold at $5.31 per ton, plus $1.35 freight from the Lake Erie ports to Pittsburgh, making a total of $6.66. Then, if this ore contains 0.02 percent phosphorus, a $0.35 premium must be added, making a total of $7.01 per ton, or 11.5c. per unit. Such ore is much sought after now by the steel plants for their open-hearth furnaces, and they actually pay even higher prices for it than those mentioned.

A question of great interest involved in the situation is, of course, how the development of the Itabira iron ore deposit to a large production may affect important economic interests in the United States, particularly those concerned with the population deriving its livelihood from ore production in the United States and from steel industries.

In my opinion, organization of an orderly importation of foreign iron ores, particularly from the neighbor countries of the Western Hemisphere, is the proper solution of the grave national problem of how to conserve and prolong the present ore supply of the steel industries of the United States. In view of the eventual exhaustion of the rich ore deposits at Lake Superior, the decision of the United States government to help Brazil financially and technically to develop its iron-ore deposits should be highly commended, as a very important step in the policy of conservation of the natural resources of the United States. I believe that the importation of Brazilian iron ore can be made so orderly that it would never adversely affect the interests of the large communities in the United States now deriving their means of livelihood from mining the ore in the Lake Superior district. Gradual exhaustion of the richest parts of the Lake Superior deposits will inevitably lead to the employment of more and more labor for mining the poorer ores of that district, and beneficiating them. The substantial increase of production of steel in this country will also probably take care of the comparatively small tonnages of imported ore.

Initiation of the Itabira enterprise at this time is particularly advantageous because of the added force it will lend to the mutual assistance pacts undertaken by the various countries of the Western Hemisphere. The avowed purpose of the United States is to promote in every possible way the betterment of living standards and economic conditions in our sister republics, and the opening of the Itabira mines, designed as it is for the mutual benefit of the countries concerned, is a most important step toward making good on that purpose. Technical skill and methods of operation perfected in the United States will be furnished Brazil with the idea of helping that country rather than solely ourselves, and the entire undertaking constitutes an excellent example of the practical application of the ideals of the Good Neighbor policy.

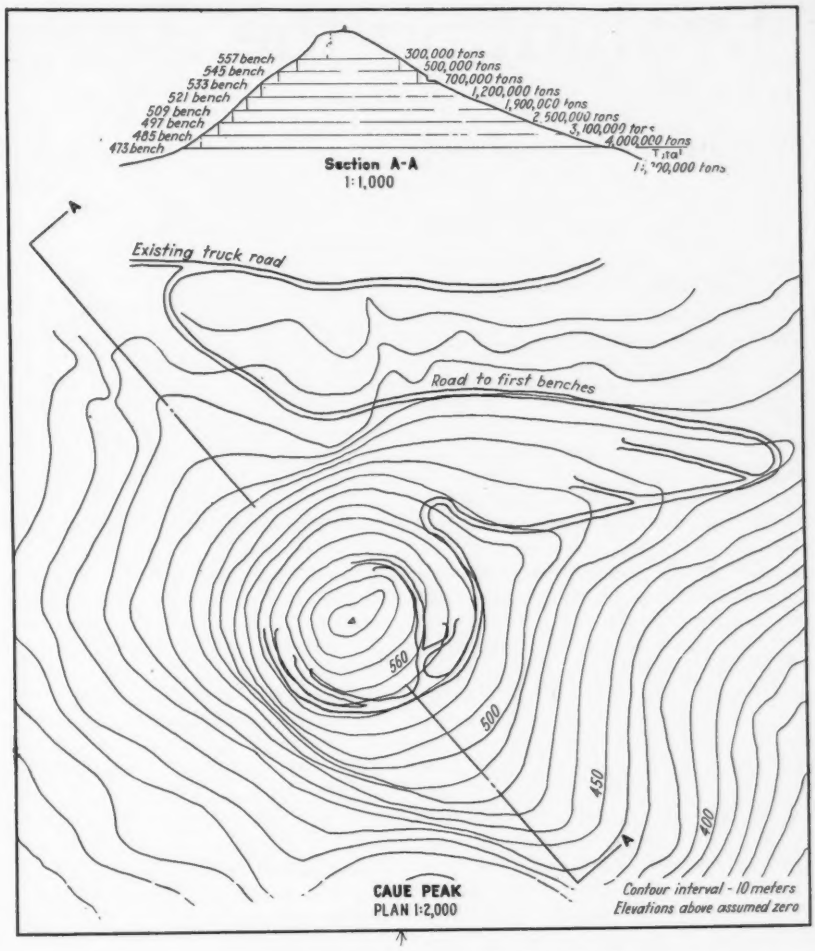


Fig. 2 . . . Plan view and section of Caue Peak showing proposed location of benches for initial mining operations and estimated tonnage available

D. D. Cone at Mascot

(*Continued from page* 50)

ore running 2 percent or more in zinc; and "shine" holes showing anything less than the foregoing down to zero.

Of interest is the fact that the company, which hitherto has continued to use carbide lamps underground, has recently provided electric cap lamps for the men of the Grasselli mine. These are distributed on a rental basis to the men, who look after the charging of the lamps themselves.

At present the total payroll includes 625 men, engaged on a six-day, 48-hr. week. Three shifts are worked at the No. 2 mine and two at the others. The concentrator runs three shifts per 24 hr. on practically a seven-day week, stopping only for repairs.

H. A. Coy is general superintendent, David Grove is mill superintendent, and William Black is mine superintendent. I. C. Mitchell is the mechanical and electrical superintendent and P. M. Arthur, director of personnel.

Evaluating the Recent Graduate

Methods used in selecting and training new staff members of the Dorr Co.

George M. Darby
Manager, Westport Mill
The Dorr Co., Inc., Westport, Conn.

PERSONALITY, technical ability, college activities, and summer jobs or plant experience are the principal factors in the estimate most employers make of the fitness of applicants for engineering positions. The Dorr Co., in its field of mineral dressing and sanitary engineering, is extremely careful in applying these factors because of the obvious advantages to both employer and employee of securing men fitted by training and temperament for the work in prospect. The following discussion of Dorr Co. methods of evaluating applicants and training new employees is offered in the hope of assisting prospective, or recent, graduate engineers to form an accurate estimate of the value of their present qualifications to industry in general.[1]

The Dorr Co., in common with most engineering firms, gives careful consideration to the applicant's seriousness of purpose, his ambition, and to his expressed determination to make engineering his life's work. Training programs are expensive, and because of this, as well as because most new men do not really begin producing until after a year or two of work, we cannot afford to hire men who will lose interest in a few months or years and transfer to other fields. Most young men applying for a position with us know a good deal about the company and its work and want specifically to become associated with the Dorr Co. This, it may be pointed out, is a desirable basis on which to apply for any position, because employers tend to favor this type of man rather than the type who knows nothing about the company and is just looking for a job.

The major question asked when considering a prospective employee is, "Is this the type of man whom we would like to represent the Dorr Co. to its clients in the field?" This stresses the ability to make definitely favorable first impressions, to be able to make and keep friends, to get along harmoniously with business associates, and in general to handle oneself as a man and to inspire confidence. These qualities can be well estimated in a short personal interview, especially if the man's attributes are checked against the qualities of successful young men whom we have employed in the past.

A study of the extra-curricular activities of the prospective employee while in college is also a good indication of the man's personality. Class activities, fraternity offices, managerial and executive jobs in college are all plus factors in determining the personality of the man. We study these activities to see if they are along managerial rather than athletic activities, and are thus able to determine whether the prospective employee has the ability to lead others and make others like to be led. These evidences of a man's ability to sell himself to his associates and to express himself well are particularly important to us. Memberships in professional societies and on teams are desirable but not necessarily indicative of personality qualifications.

Technical competence, good marks throughout the college career, are definitely desirable, but they do not need to be of honor grade. A man has only to demonstrate his ability to undertake a college course and to acquit himself creditably in it. A careful study of the thesis subject that the man has selected is quite a good key to his scientific interest and the kind of work that he would like to continue in professional life. Naturally, mathematics play quite an important part in mineral dressing today, and also chemistry and physical chemistry in flotation, and the applicant's knowledge of these subjects is given due consideration according to the type of work in which he would be engaged. We do, however, rather discount a man who is consistently low in all cultural subjects, such as English, history, and languages, because this is quite a good indication of a one-track scientific mind, and it is not our policy to favor the unbalanced type of education.

We attempt to draw our staff not only from men living in all parts of the country, but also from graduates of colleges broadly distributed in the East, West, and Middle West. The possession of a degree from a well-recognized institution helps the man in his contacts with outsiders, and, thus, it also helps us. We would prefer a mining and metallurgical engineer who has attended one of our well-recognized colleges located in the center of a mining area and drawing its student body from mining communities. Such a man is conditioned in mining and metallurgy, and, once placed in this industry, he is not likely to shift elsewhere. There are, however, several high-grade colleges in the East where mineral dressing is one of the major subjects taught, and graduates of these colleges are also highly desirable.

With this same thought in mind, we feel that a man will fit in best with us if his father is engaged in industry, preferably mining or metallurgy. Such a man has been pretty well brought up in industrial influences and unlike the son of a banker or broker or non-technical business man, he is not likely to get discouraged and shift into some other more remunerative line of work before he reaches the peak of his abilities.

We put quite a lot of weight on the quantity of the prospective employee's activities on summer jobs, especially if he has worked in mines or metallurgical plants or has engaged in other engineering pursuits. It may be the only chance the man has had to acquaint himself with the attitude of labor and to discover how the users of our equipment and services regard us and our products. We are inclined to be a little skeptical of any young man who has not spent at least one or two summers in overalls, or in the field, at work which supplements his college training. The ideal man, in addition to the foregoing, possesses one or two years of actual plant operating experience following his graduation. In this way he gets something that we cannot give him during a training period. Furthermore, he acquires a realistic, rather than a theoretical, point of view of his past education, and becomes a better all-round man in every respect.

In addition to all covered in the foregoing we naturally take for granted such qualities as honesty, moral responsibility, and a reasonable degree of sobriety. References, as a rule, do not carry too much weight in our consideration of a prospective employee, because, obviously, a man will refer only to men who are more or less certain to give him a good send-off.

Our usual practice is to have the prospective employee meet the personnel manager first. Then he is

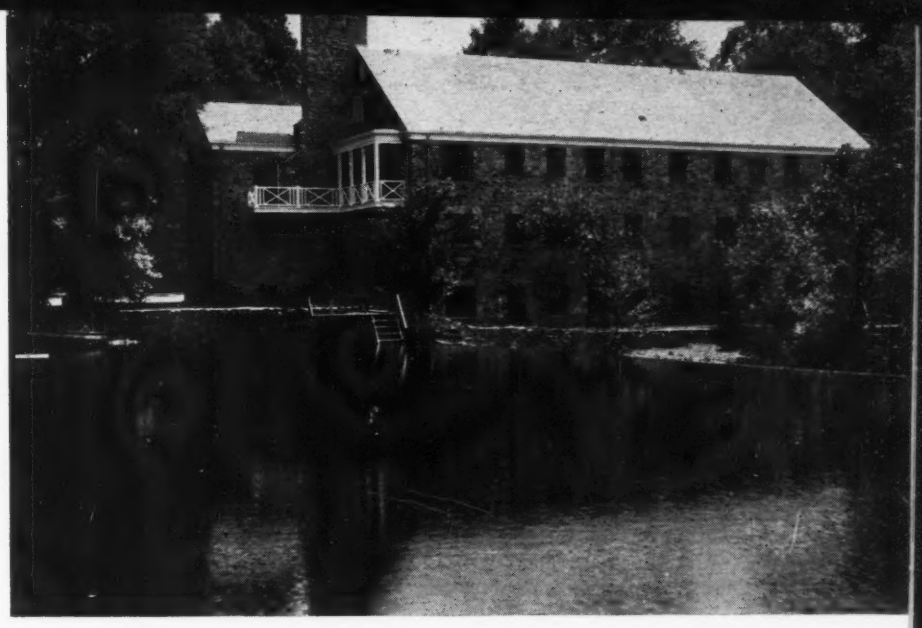
[1] From a paper presented by the author at the June, 1942, meeting of the Society for the Promotion of Engineering Education held at Columbia University, New York, N. Y.

routed to one or more of the executives (who might some day require his services), who size up his general appearance and personality. Then he is passed on to some of the technical men, who determine from conversations with him, his technical ability and his activities during college training and also before and after his college preparation. In this way the company has the benefit of opinions on the prospective employee from three standpoints—sales, research and development, and engineering—by men who are well versed in the various qualifications desirable for each department. Broadly, the man we seek is well diversified as to experience and ability, a man who can do a creditable job in sales, engineering, or research and development.

Before a successful applicant is actually put to work, a period of training, arranged by the personnel department, must be undergone. Time spent in training varies from one and one-half to nine months, depending on the man's experience and on the work which he will one day be required to do. The Westport, Conn., mill trains men in laboratory techniques and testing operations; the Dorr Co. shops in Denver, Colo., train men in design and construction of Dorr equipment, and the Field Engineering Division supplies training in installation, service, and repair of these machines. A definite curriculum is set up for each man entering the company, so that his progress can be recorded and a better idea gained as to where he will best fit into the organization. For example, an inexperienced junior engineer's training will ordinarily include six months at Westport, one month at Denver, and two months in the field.

As an indication of the scope of our engineers' activities, a more detailed review of the training program may be of interest. At Westport, first of all, the new man is furnished with a list of suggested reading, with at least some of which he should already be familiar. This includes standard works on ore dressing as well as various Dorr Co. manuals and bulletins, and the value of close attention to technical magazines is also pointed out. As a preliminary to actual laboratory work, moreover, instruction is given in methods of recording data, writing reports, and filing and using accumulated data. Whatever may have been the newcomer's experience, this latter instruction is always given in order to insure uniformity throughout the company in taking and filing data.

Because much of Dorr Co.'s work deals with thickening and classification, the major part of the laboratory training covers these subjects. Uniform and fully tested techniques are taught for both laboratory and field sampling, tonnage measurements, classification tests, and thickener tests. Particular attention is paid to the determination of proper size of equipment for given installations. The same procedure is applied to the study of agitation apparatus, flocculation of trade wastes, filtration, and micron sizing. Depending somewhat on individual aptitudes, considerable instruction is thereafter given in metallurgical test work covering flotation, cyanidation, gravity concentration, and fine grinding of ores. This may sound like a great deal to be absorbed in short order, but by concentrated effort our "students" always manage to learn much more than they may at first have believed possible. Of course, the daily application of the techniques being studied to actual commercial test work and installation design heightens the student's interest considerably.



Westport Mill, headquarters of the laboratory and pilot plant activities of the Dorr Co., Inc.

In the Dorr Co. shops in Denver, the trainee is given for home study complete drawings, erection and operating instructions, and lubrication instructions for each Dorr machine and is asked to familiarize himself thoroughly with them. He spends up to a month in the shops, becoming acquainted through observation, and also works as an assembly man's helper, with each branch of the manufacture of Dorr equipment.

This training is then supplemented by field work under a senior field engineer, during which the trainee learns how to erect the equipment in the field and how to prepare it for operation and to instruct others how best to operate it. By watching the senior engineer he also learns how to deal with customers and with the customer's men who must help him set up the apparatus. This is often the most difficult, because it is the most intangible, as well as most varied, part of the training, and it is in this branch of the work that tact, resourcefulness, and initiative are most freely called upon. He may find himself required to move a classifier up a mountainside for a customer who doesn't see how it can be done, and next week he may have to explain gently to another customer that even the best of equipment needs occasional lubrication and a certain minimum of intelligent control. It is lively work, and for the right type of man, extremely interesting.

That our methods of selection and training of new men work out well has been demonstrated by the records of seventeen young engineers hired betwen Jan. 1, 1936, and Feb. 18, 1937. This period, following the depression of the early thirties, saw a material growth in our activities and a consequent abnormally large induction of new staff members. Eight of these men were from homes in the Northeastern United States, two were from the Southeast, three from the Far West, and four from Canada or abroad. Universities represented were well distributed in the regions named and a total of 25 degrees (two PhD., three M.S.) had been acquired by these men in the fields of mining, chemical, mechanical, and sanitary engineering.

Of these seventeen men, eight are still with the Dorr Co., three have been called to military or naval service, and only six have either resigned or been laid off. That only about one-third of these seventeen beginners proved to be unsatisfactory or found more attractive work elsewhere is a record of which we are rather proud. It is a practical demonstration that care in selection, on the part of both employer and applicant, and thoroughness in training, will result most often in continued employment and mutual satisfaction.

How to Obtain a Government Mining Loan

Proper procedure will facilitate prompt action

MINING LOANS granted by the Reconstruction Finance Corp. are of three types—general mining, development, and preliminary development loans. Each of these is for a specific purpose, and the applicant will save himself time and trouble by applying in the first instance for the proper type of loan and on the proper forms. Many applicants complain of delays in the processing of applications or that the forms do not fit their situations, but in fact most of the delays are due to the applicants' own carelessness in failing to apply for the proper type of loan, to use the correct forms, or to give full information in applying. Any pertinent facts not included in the forms can be appended to applications, and any sections in the forms not applicable to conditions can be omitted.

Creditors may be required to subordinate claims, and the RFC must approve professional fees, commissions, salaries, and dividends.

General Mining Loans

Apply on RFC Form L-197. These are collateral loans, made for mining, milling, or smelting mineral deposits of established worth by providing working capital or financing construction of necessary facilities. The usual collateral is a blocked-out mineral deposit or plant of demonstrable worth, but other properties, not necessarily related, can be substituted as security. Loans will not be granted to acquire land, to prospect, or to promote. If ore reserves are offered as collateral they must be blocked out and accessible for inspection. Complete maps of all workings should be submitted showing locations where samples were taken. Assays and a detailed description of the method of sampling and computing reserves should be submitted. If handling or treatment facilities exist, a description, including plans, flowsheet, and photographs if available, should be included. Before loan is completed, proof of title must be furnished. The applicant may be required to make a deposit to cover the cost of an examination of the property. The application must contain full information as to the method and estimated cost of mining. If construction of a mill is contemplated, the proposed flow-sheet and metallurgical tests should be supplied, plus the estimated cost of construction and per-ton operating costs. If ore or concentrates are to be sold to a custom mill or smelter, copies of the contracts, actual or proposed, should be furnished. Complete information should be given concerning the sources and costs of water and power. Placer property applications should show detailed drill-hole or test-pit loss and assays on a suitable map. An itemized schedule of past and anticipated expenditures on the property should be supplied, and a description of all equipment currently on the property. If property concerned is held under a lease, suitable arrangements must be made to secure the mortgage rights of the corporation to the property offered as collateral, in the event of the lessee's default. Applications should be submitted to Reconstruction Finance Corp., 811 Vermont Ave., Washington, D. C., in duplicate.

Development Loans

Apply on RFC Form L-254. The purpose of these loans is to develop ore known or presumed on tangible evidence to exist, not to mine, mill, promote, acquire acreage, or prospect. Single loans are limited to $20,000, and not more than a total of $40,000 may be lent to one party. A chattel mortgage on equipment purchased with funds lent must be given, but no further security is required except a lien on the proceeds of operation. If the operation fails to pay, the Corporation does not undertake to collect from the borrowers personally. However, loans are made only after examination of the property by the Corporation's engineers and their approval of the proposed plan of operations. Expenditures must be made only as outlined or approved by the Corporation. Applications should be accompanied by adequate maps of the property, showing all workings, samplings, and assays, as well as proposed development and anticipated results. Description of the method of sampling should be given in detail. A development schedule, including estimated costs, should be furnished; also an inventory of all usable equipment, proof of title, sources and costs of water and power, a statement of expenditures to date, and a plan of operating and financing operation after development is completed. The Corporation reserves the right to discontinue payment of further installments at any time it considers the same to be unjustified by results or information obtained to date. Applications should be submitted in duplicate as above.

Preliminary Development Loans

Apply on RFC Form L-332. These loans, limited to $5,000, are made for purposes of unwatering, retimbering, reopening, or initiating development of mine workings, or for facilitating sampling, if, in the opinion of RFC engineers, such operations are likely to make the property eligible for a development loan. They will not be granted for prospecting, land acquisition, promotion, production or treatment. Applications should give full information known of mine workings, orebodies, and assay reports. Maps, if available, should be furnished. A chattel mortgage must be given on any equipment acquired with the funds lent, but payment is expected out of the proceeds of operation, if any, and other security is not required except a lien on such proceeds. Application should be made in duplicate to Reconstruction Finance Corp., 811 Vermont Ave., Washington, D. C., except for properties in the following states, in which case they should be sent to local supervising engineers:

Arizona—W. B. Gohring, 325 Heard Building, Phoenix, Ariz.

California—George W. Rust, 200 Bush St., San Francisco, Calif.

Colorado—Carl I. Dismant, 410 Boston Building, Denver, Colo.

Montana—Arthur E. DeCelles, 612 Power Block, Helena, Mont.

Oregon—Graham J. Mitchell, 444 Pittock Block, Portland, Oregon.

Utah—Herbert M. Fay, Dooly Building, Salt Lake City, Utah.

Washington—Howard P. Sherman, Columbia Building, Spokane, Wash.

L. A. Wood's Stephens mine in the Sweetwater barytes district of eastern Tennessee. A shovel is at work at "1" behind the ridge left in mining. The ground this side of the trees has been stripped, much of it with tractor-drawn wheeled scrapers.

BARYTES—A Non-Metallic Product of Eastern Tennessee

L. A. Wood, with six operating mines and plants in the Sweetwater district and others in north Georgia, is a leading figure in this essential industry

A. H. Hubbell
Associate Editor

BARYTES PRODUCTION has an important place in the mineral industry of Tennessee. Most of the output comes from the eastern part of the State, principally from the Sweetwater district, which, centering in the town of the same name, 40 miles southwest of Knoxville, is considered by some to extend well towards the latter place on the northeast and to Cleveland in the opposite direction. This fertile, rolling area is in the Great or Appalachian Valley and exhibits a topography consisting of ridges of the more-resistant rocks[1] altering with valleys formed by solution or erosion in the softer strata between, all trending northeast-southwest.

Underlying most of the Sweetwater district is the Beekmantown, or Knox, limestone and dolomite. In shattered zones of this formation there are fissure veins,[2] irregular in pattern and width and lacking persistence. These carry barite, pyrite, and fluorspar and other primary vein minerals, a banded structure being typical, with the barite predominating. It is in the residual surface clays resulting from the weathering of this formation that the commercial deposits of barytes have been found. The veins themselves have yielded no production.

The barytes in the overlying residual clays is distributed irregularly, reflecting the irregularity in strike and dip of the parent veins beneath. It occurs in lumps and nodules ranging from several inches in dimensions down to small mesh sizes. It is commonly white or colorless. The deposits are worked in open pits, stripping and mining being done mechanically. Overburden is variable in depth, ranging from nothing to 40 ft. The commercial deposit beneath may be as much as 30 ft. in depth. The open pits of the district have in places been excavated to 125 ft. beneath the original surface. Motor trucks haul the mined material to the washing plant. Each mine customarily has its own washer. The flowsheet of the latter is simple, comprising usually a log washer, a trommel screen, and jigs. In some operations the washed product is subsequently cleaned of the remaining iron by tabling, drying, sizing, and magnetic separation.

L. A. Wood, of Sweetwater, who heads the L. A. Wood Co., is the principal producer of barytes in Tennessee, if not in the United States. Today he is operating six mines in the district. These are scattered over an area approximately 16 by 50 miles in dimensions, situated in the central part of the Sweetwater region. They are, respectively, the Stephens mine, which is the largest; the Harmon, or "Leased," mine; and the Garrison, Pond Creek, Fork Creek, and Calhoun mines.

In addition, Mr. Wood, together with A. W. Wood, a son, is mining and washing barytes in Bartow County in north Georgia, under the name of the Barytes Mining Co. During the past summer he also acquired new holdings in the same district, taking over the plant and equipment of the Cartersville Barium Co. from R. D. Hale, of Cartersville, and leasing certain barytes-bearing ground owned by the Etowah Development Co.

Of the properties in the Sweetwater district, the Stephens mine was visited in the spring of 1941 and again during the past summer. Here, some years ago, the original showings of barytes on the surface were worked by "dry mining," so-called, using pick and shovel. The exposure since then has been followed down to the east in a pit that now covers about ten acres, counting stripped but unmined ground to the southeast beyond the present pit bottom. The pit is shown in the accompanying panorama. Maximum depth is about 125 ft.

In the bottom of the oldest part is a pond (at the right in the photograph) from which the adjacent washing plant's supply of new water is obtained. This pond is fed by several springs in the bottom. Two motor-driven (50-hp. electric motor) centrifugal pumps, mounted on a float on the pond surface, pump to the washer, which is seen at the head of the road going out of the pit at the right. Electric power is taken down into the pit for this purpose.

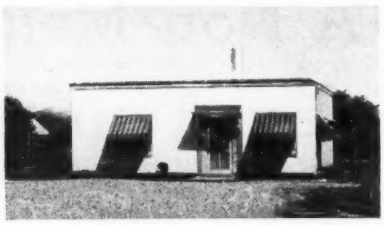
In the pit bottom a Bucyrus 20-B full-revolving diesel shovel with a ¾-cu.yd. dipper is at work, advancing two adjacent faces into the stripped ground. The stripping has been done in most orderly manner, the surface being sloped down from grass roots to the point where the shovel is working. This stripping was carried out with two Allis-Chalmers diesel-driven tractors operating 10-cu.yd. Carryall scrapers. The tractors are powered each with a General Motors diesel en-

[1] C. H. Gordon: "The Resources of Tennessee," Vol. VIII, No. 1, Jan., 1918.

[2] R. A. Laurence: "Origin of the Sweet-Water, Tennessee, Barite Deposits," *Econ. Geol.*, March-April, 1939.

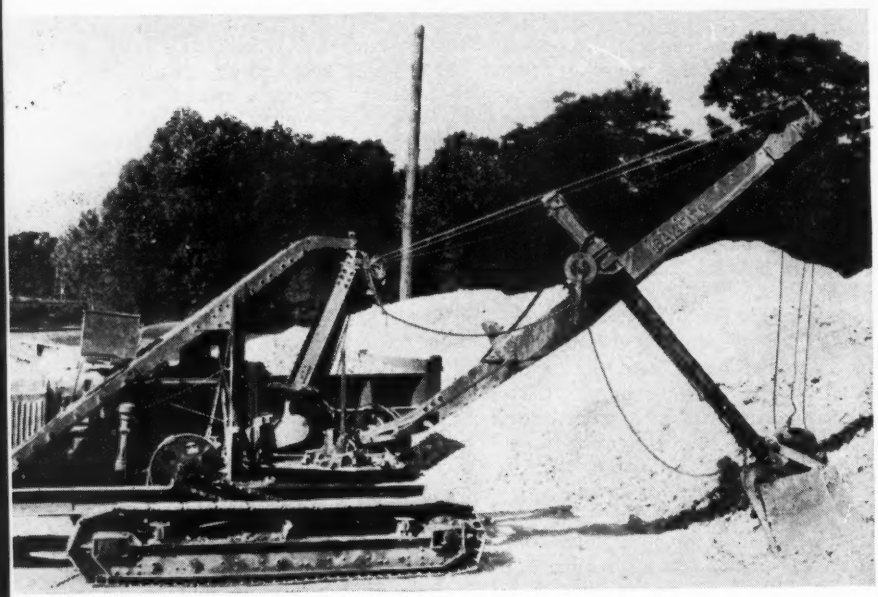
L. A. Wood, outside the modern office recently erected at his central loading plant on the railroad

A. W. Wood, who with L. A. Wood, operates the Barytes Mining Co.'s property in north Georgia

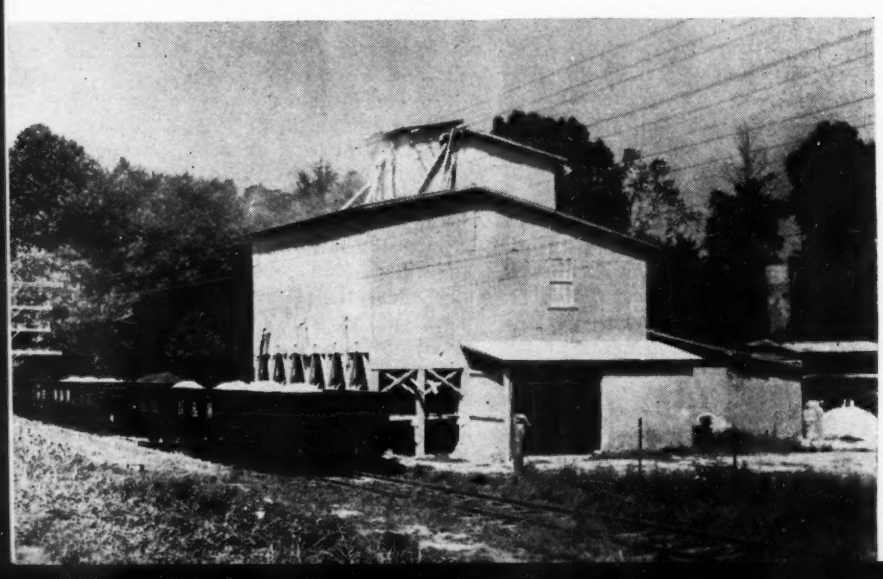


The office at the loading plant

One of the tractor-mounted shovels used in rehandling and loading the washed barytes dumped by trucks in the open-air storage space at the loading plant



A trainload of finished barytes awaiting shipment on the railroad siding at the loading plant. The building houses equipment for drying and for the removal of iron. Near by, washed barytes delivered by the trucks from the six mines is stored in the open, prior to loading



gine. According to the mine foreman, J. L. Barker, 30 ft. of overburden is approximately the maximum that can be handled. A tractor is customarily employed in the pit in maintaining the haulage road out.

Two 1½-ton Ford trucks with 3-cu.yd. bodies serve the shovel. The distance out of the pit to the washer is about 1,000 ft.

Another pit immediately to the right of the road shown in the photograph is on the same "run" or occurrence of barytes. The ground between has been stripped by tractor and scraper in similar orderly manner, the fragments of barytes being visible in the surface. This second pit also has a pond in the bottom, which, however, is only surface run-off. It is not being worked, although a shovel like that in the other pit stands ready for use whenever it is required.

For pit operations, only the shovel operator, in addition to the truck drivers, is required. In bad weather a second man will be used in cleaning up.

The trucks deliver their loads to a grizzly in the "bull pen" at the head of the washer, running up a ramp to reach it. With a 2-in. hose the dirt is washed through the bars, spaced 4 in. apart, into a 27-ft. double-log washer, which overflows to waste. The log product then passes through a trommel having a 1¼-in. hole.

Trommel oversize is shipped, if clean. Otherwise it is crushed in a jaw crusher and sent to a four-cell set of Harz-type jigs. The cup product of the cells is cleaned on a picking belt to remove iron and is ready for shipping.

Trommel undersize is jigged on a similar four-cell set. Here the cup product is treated in the same way as that from the other set of jigs, to make a shipping product. The hutch products of the two sets of jigs are combined and sent to a table plant for further treatment. Jig tails are sent to waste.

In general, the larger pieces containing iron are removed by hand, smaller pieces by the jigs, and the smallest by special treatment following the tables mentioned.

Water required for washing is 2,000 g.p.m. Of this 650 g.p.m. is new water, supplied from the pond.

Operations at the other five mines are similar in character. Each has its own washing plant, moreover, where the washing consists of log washing and jigging, with the usual related steps. Products shipped include lump ore and washed crude ore in various sizes and grades.

Products of the six plants are trucked to a central loading yard on the railroad. Here gas-engine-driven shovels are used for loading. Some of the ore is also elevated to the bins shown in the photograph, from which

it is run into railroad cars by gravity. The structure housing the bins also contains a revolving kiln, in which ore that is too high grade in iron to make high-grade barytes is decrepitated. After decrepitation, the iron is screened out.

At this loading station, an up-to-date four-room office has recently been erected. Outside walls and the partitions between rooms are built of cinder block. The structure is fireproof, except only the doors. It is handsomely equipped in modern style. Here Mr. Wood makes his headquarters. In the Sweetwater district the number of employees on his payroll amounts to 175.

Much of his output of barytes is being produced under a high priority rating extended in a sublet government contract. To cite some of its war-time uses, barytes is a basic raw material for barium carbonate and barium chloride used in the production of bomb bodies, airplane parts, armor plate, machine parts, high-speed tool steel, and case-hardening compounds. Likewise for barium peroxide employed in ammunition, for vinylite used in Navy cable, and in certain plastics.

The Georgia Operations

In Bartow County, Ga., the Barytes Mining Co. is working a property that it has had since 1936. Previously it belonged to the Cherokee Ocher Co. and had been operated for years, yielding a large tonnage. The overburden is 10 to 30 ft. thick. The barytes-bearing material beneath has never been less than 50 ft. in depth.

Stripping is done with the same two Allis-Chalmers tractors and Carry-all scrapers that have been used at the Stephens mine, in Tennessee. In all, it is expected, 50,000 cu.yd. will be stripped by these means. Mining is carried on with a 20-B ¾-cu.yd. Bucyrus diesel-driven shovel. Trucks, 13 in number, are used for hauling stripping and barytes ore as well as supplies. They are of Ford make and have 2½- and 3-cu.yd. bodies. Rain water is removed from the pit with a centrifugal pump.

In its barytes content this property is a little lower in grade than are the mines in Tennessee, though the output is more uniform. In the washer, where the procedure is about the same as that described at the Stephens mine, an effort is made to produce a high-grade product running 96 percent $BaSO_4$ or better. A low-grade product, 92 percent, is also made. The washer stands near the office.

At this property 70 men in all are employed on two 9-hr. shifts six days a week. About 15 of the 70 men are engaged in the washing plant on each shift. No repair work is done on Sunday. A. W. Wood is in charge of operations.

Washing plant of Barytes Mining Co., in northern Georgia. A truck is delivering its load from the mine near by

At the pit of Barytes Mining Co., in Georgia. A loaded truck is coming out

Mining and Washing Kaolin in Western North Carolina

(*Continued from page* 53)

wheel classifier flow in a launder to a rotary screen in the mica plant further down the slope. This is built of ¼-in. diameter rods, spaced ¼ in. apart, running lengthwise. Near the end of the screen two rectangular sections of the screen surface have the rods running at right angles to the other rods and parallel with the central axis of the rotary screen. Screen oversize goes to waste. Undersize is dewatered on a drag, put through a set of rolls to crush the sand and then through another rotary screen with 6-mesh cloth. The 6-mesh oversize is elevated to a second set of rolls and then passed through a 3-ft. diameter 8-mesh trommel, the undersize of which is wasted and the oversize is finished mica for drying.

The 8-mesh trommel, 3 ft. in diameter, terminates in a section that is 1 ft. long and 1 ft. larger in diameter than the rest of the screen. This provides a 4-ft. diameter trommel 1 ft. long, which serves to carry the oversize from the 3-ft. diameter section under water, thereby washing any sand off the mica.

The 6-mesh undersize goes to a five-cell Harz jig, the tailings of which are mica and the hutch product is waste. The mica is sent to the drying plant.

Settlings from the settling box and the settling troughs flow in a launder down the slope to one of two tanks in the mica plant. The water is decanted when the tank is full and the solids are sluiced to an elevator and so to a second five-cell set of jigs, the stroke in the cells ranging from ½ to 1 in. The hutch product is sand and is sent to the river. The jig tailings are mica. They are dewatered, which also removes the fine sand, and sent to the drying plant.

The mica-drying plant thus receives as its feed the tailings from the fine and coarse jigs respectively and the plus-8-mesh material from the second set of rolls. After being dried the mica is screened and bagged for shipment.

Some sheet mica is produced in the pit by hand operations. It is sheeted and sold to the local buyer.

To operate the plants requires a total of 15 men on clay and a like number on mica.

Mine, Shop, and Plant

Arc Welding in a Copper Smelter

IS FULL ADVANTAGE taken of welding in shop and plant today? Specifically as to the electric arc, its potentialities are not fully appreciated by many in the maintenance of their plants, in the opinion of one of the prize winners under the recent $200,000 Industrial Progress Award Program conducted by the James F. Lincoln Arc Welding Foundation for reports and improvements made in this field of application. This successful contestant was Gordon B. Forbes, mechanical superintendent of the American Smelting & Refining Co.'s copper smelter at Garfield, Utah, his paper describing the increasing application of arc welding in this plant. Mr. Forbes' story runs as follows:

In 1935 I started missionary work with my company toward utilizing the electric arc more in maintenance work in the plant. At this time we had one 200-amp. machine, used for light patch work only. A 400-amp. machine was purchased.

It was my good fortune to have work with me the chief engineer of the company, a very aggressive worker, and we soon had new work in his office coming out with welding included in the design. The result was that each year thereafter it was necessary to increase our welding capacity. By the end of 1939 we had 12 welding machines, one large mechanical flame-cutting machine, a 10x10x14-ft. stress-relieving furnace, a set of bending brakes, a squaring shear, a complete ventilating system to take welding fume out of the shops, and miscellaneous equipment that would facilitate welding work. We have on order two 6,000-lb. welding positioners.

We also had 18 very good operators. Every one concerned had attained the necessary confidence in the electric arc. In all design and maintenance work our first thought now was, can it be welded? In the last two years we have done things that four years ago would have seemed impossible.

In this discussion I will show how several problems were overcome through use of welded construction, this involving in most cases a redesign and in some a new design. Costs of welded design were ignored, because we knew by experience, with respect to the average piece of equipment, that it would cost so much to make it of cast iron or cast steel; also how much welded design would cost. Furthermore, in the case of each of the following designs, the first consideration, with one exception, was: will it increase the continuity of operations or promote employee safety?

1. *Welded Slag Pot*—This was built to handle slag from a lead-plant blast furnace. A pot of greater capacity was wanted, due to the increased tonnage handled. On analysis, it was found impossible to increase the height of the original design, due to lack of headroom. We decided on an elliptical shape to obtain the capacity required, and to use welded construction.

The bowl proper is of 1½-in. plate with 1¼-in. ribs. To form it with the tools available presented a problem. The conical sections for each end were heated in an improvised furnace adjacent to a set of rolls built to roll ½ in. plate cold. Each plate was heated to about 1,600 deg. F. and formed in the rolls with a single heat with remarkable accuracy, as will be noted in the pictures by observing the alignment of the welded joints. It was necessary that these be accurately aligned, as otherwise they might keep the slag shell from releasing properly when emptying the pot.

The spherical sections provided another problem. This was solved by casting a half-section sphere of cast iron and machining to proper radii. A ring was provided on which to set the disk. All of this was then taken to the blacksmith shop, and the disk was heated and placed under a 2,500-lb. steam hammer. Four blows formed the half sphere, which, when cut in half, gave the proper quarter section to complete the bowl ends.

The center section is in one piece, thereby calling for a minimum of welded joints, of which there are four.

All of the material was laid out on one sheet of steel and then cut on a flame-cutting machine.

In picture 6 the method of applying the trunnions will be noted. To secure good alignment, a layout was made on each end; then a hole large enough to permit a 4-in. boring bar to enter was flame-cut. The bowl was then placed upside down on a 42-in. lathe and the hole bored to size. The trunnion shafts were then made up on a piece of 6-in. extra-heavy pipe. Bored holes were scarfed inside and out for welding, and the shaft was inserted and welded outside and reinforcing ribs were attached. The shafts were then cut off inside and the welding was completed. This method was then checked on the surface plate and it was found that perfect alignment had been maintained. Next, the welds were ground flush on the inside to permit easy shelling of the slag. The bowl was then stress-relieved at 1,400 deg. F. in the gas-fired furnace.

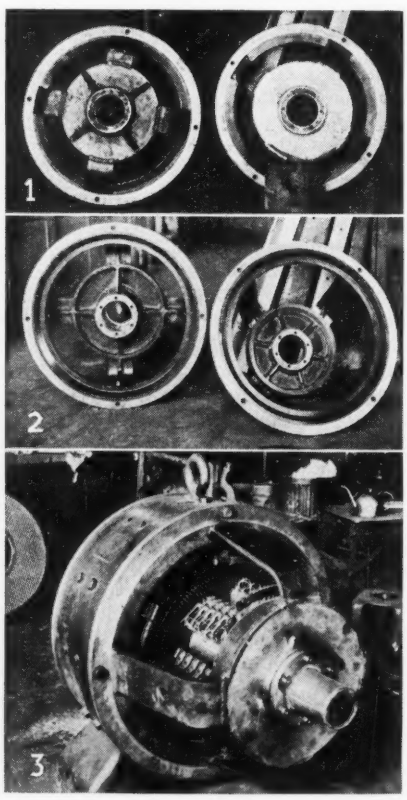
The underslung frame is a welded section, made up of stock bar iron and a flame-cut section for the corners of the offset. This corner section is thicker than the adjoining pieces that make the web. Thus we were able to develop the strength wanted, which could not be obtained in any H-beams of the required depth.

Brake beam, spring cradles, and worm shaft supports also are of welded construction. This slag pot was built complete in our shop, save for the wheels, axles, springs, and couplers. As stated, costs were not considered at the start. However, we knew that, by using welded design as far as possible and with six pots to build, we could build them much more cheaply than by the conventional method of making the patterns required and having steel castings made.

Accurate costs were kept and we found we had built them for $1,485.65 each, including material, labor, overhead, and insurance.

2. *Welded End Bells for 100-hp.*

Showing welded end bells for motors



Electric Motor—We had four 100-hp. motors which had been giving trouble due to running with too tight a belt, this causing the sleeve bearing to burn out. We decided that, to eliminate this we should use an anti-friction bearing and that welded construction would be most economical because the motors were d.c. units, with their large end bells, and patterns would be expensive.

As shown in pictures 1, 2 and 3, the welded end bells were made up of standard bar-iron sections, plate, and one forging. In assembling, $\frac{1}{8}$-in. machining stock was allowed where required. After welding, stress relieving was applied.

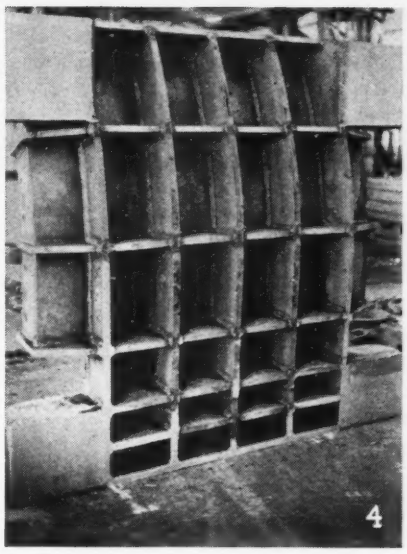
Picture 3 shows the completed construction. These motors have not been out of service in 13 months of operation. The savings effected are great, in view of the fact that all operation stops if the motors fail, resulting in lost time and idleness. Previously $21 per hour had been the labor cost of idle waiting for repairs.

3. *Bosh Plates for Blister-Copper Cooling Sump*—In casting blister copper, the bars are dumped into a cooling sump in which bosh plates are supported, over which a bar-type elevator or conveyor runs to bring the blister out. These copper bars weigh 500 lb. each and fall 3½ ft. onto the plates at the rate of six per minute. When made of cast iron and weighing 7,000 lb. each, the plates would eventually break in two. Here again, operating continuity was interrupted, and the management wanted to know what could be done quickly.

Welded construction was adopted. The necessary material was on hand. Work was started Dec. 11, 1941, completed Dec. 20, and placed in operation Dec. 24. The drawings that had served for cast iron were used for fabrication, plate on hand nearest to the dimensions required being employed. This was 2-in. plate for the top and 1¼-in. and 1½-in. for all ribs.

Picture 4 is a view of the upper section. Its massiveness can be seen; also that all brackets were machined.

Here is a splendid example of the utility of the electric arc with the aid of a flame-cutting machine. In 13 days after it was decided to do this job it was in operation, and I know of no other way such speed could be attained. If cast steel had been used,



Bottom view of upper section of bosh plate for cooling sump

it would have required more time than this just to make the patterns, and under present condition it would have taken that long at least to get priority.

In this case, as an exception, we kept accurate cost of material and labor. The items were as follows:

Steel plate, 9,800 lb., at 6c.	$588.00
Welding rod, 550 lb., at 9c.	49.50
Labor	538.50
	$1,176.00

Cast-iron plates cost $700 per set and averaged one replacement per year, the work of installing costing $550, a total of $1,250. The welded steel plates should last several years and will more than pay for themselves in the first year.

4. *Copper Casting Machine, Upper and Lower Track Rings*—In casting blister copper, the molds used are supported by arms which in turn hang from the rim of the upper track ring. Conical rolls fit between the upper and lower rings. The upper ring is rotated by a driving mechanism. These, too, were made of cast iron. Due to explosions of blister copper under certain conditions, the upper ring would break and a patch would be placed over the break. This would continue until it was impossible to patch again. Then a new wheel body would be installed and the process repeated. This replacement would vary but would average one per year.

These castings cost $2,311 in place, divided as follows: 27,220 lb. of castings at 5c., $1,361; machining, installation, etc., $950. Total, $2,311.

Eighteen months ago a failure at a critical time raised the question about replacing the castings with steel castings. I again suggested welding. Welding was held to a minimum by use of large plate sections and flame-cutting to shape. The bottom ring on the top section is of 2½-in. plate, as is the corresponding plate on the bottom section. These were formed to the required taper to accommodate the conical rolls. The ring on the upper ring is of 1-in. plate as is the spider. All ribs were cut from sections that had been cut out to form the spider. The top edge of the ring was reinforced with 2-in. square bar.

These parts have been in service 16 months without giving trouble. Their ultimate life now appears to depend on how long the lower ring in contact with rolls will wear. When worn, it can be cut off and replaced.

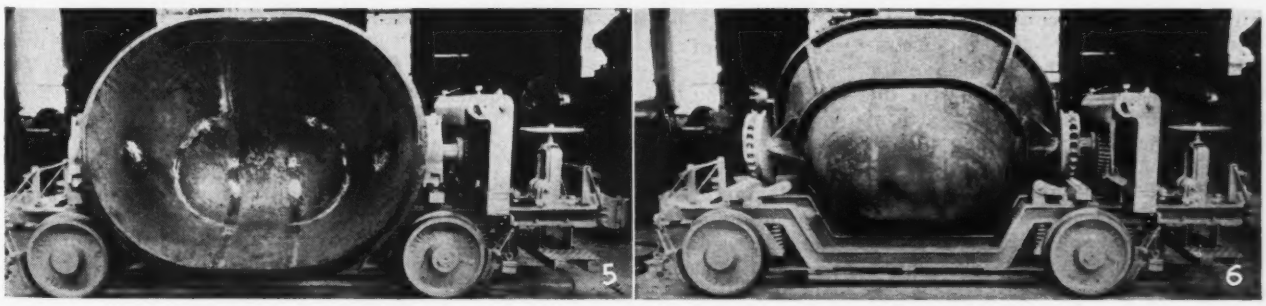
The cost was as follows: 22,620 lb. of plate at 3.5c., $781.70; labor, miscellaneous material, machining, installation, $1,676. Total, $2,457.70. Estimated cost of cast-steel castings submitted by a company on the Pacific Coast, including pattern cost, was $4,675.50.

Thus, a net saving of $2,217.80 was effected through use of welded design over cast steel, and due to the cost of patching and the delays caused by cast-iron castings breaking, it can be said the welded design cost less by at least $500 for the first year of operation and is now making a real return on the changeover, this with the added advantage that the continuity of operation, which has been made possible, has enabled us to keep production at a maximum.

(*To be continued*)

That V-for-Victory Belt

WHETHER IT BE that a belt pushes or pulls, all of the elements in a multiple drive work in unison, each taking its full share of the load—if the drive is properly adjusted. The



Two views of welded slag pot

life of the drive depends on the details of the installation and its surroundings.

This matter of life is important, now that equipment is hard to get or slow in coming. At the moment, it gets attention from two sources. Research engineers of the V-belt-Drive Association have 23 suggestions on how to conserve the life of the product in which they are interested. And an individual manufacturer, B. F. Goodrich, dwells on the effect of using a tension higher than that recommended in shortening the life of a drive.

As to new drives, say the engineers, "underbelting" is wasteful. Experience shows that using four belts instead of five cuts the life by 60 percent. Talking in terms of life expectancy, like insurance salesmen, they say that, on the basis of ten belts being the normal requirement, the addition of one belt will increase the life of all belts in the drive by 40 percent; and removing one will decrease it 35 percent. Larger pulleys should be used, they add, and the belt speed kept within the limit recommended. Use of smaller sheaves increases tension and bending, causing overheating and break-down of the belt structure. Use of idlers to secure tension is not recommended if it causes back-bend on the belts.

Tests as to the effect of excessive tension were made by the manufacturer cited. Three grades of transmission belting of the present war-time construction were used. The tests were run at 15 p.s.i. per ply, or 720 lb. total for the tension, the recommended figure, and at 18 p.s.i. per ply, a total of 864 lb. tension, on 4-in. pulleys. Belts were all 6 in. wide, 30 ft. in length, spliced in 10-ft. endless lengths. Tests were highly accelerated.

Belt No. 1 ran for 95 hr. before breakdown, while under the 18-lb. tension, and increased its life to 230 hr. before failure when the 15-lb. tension was used.

Pelt No. 2 ran for 88 hr. at the 18-lb. tension, and for 263 hr. before failure at 15 lb.

Belt No. 3 ran for 15 hr. under 18-lb. tension, and the service life before failure jumped to 48 hr. under the 15-lb. tension.

Conclusions reached are that an increase of 3 lb. p.s.i. per ply over the recommended tension results in the belt giving only approximately one-third of its useful service life.

In giving these results, the manufacturer points out that because of the short, highly accelerated nature of the tests they are not an index to life in actual service, and were made only to get data on the ratio of tension to belt life. To have any direct evaluation to real service, tests should be made for much longer periods.

As to the effect of excessive speed, the V-belt Drive Association's research engineers point out that combinations of V-belts and sheave have different critical speeds at which centrifugal force tends to throw the belts away from the grooves. With the speed above that recommended, a considerable loss of horsepower per belt results. Increasing the tension, however, to overcome centrifugal force reduces the life, as already shown.

When installing or replacing drives, to cite the other suggestions, the motor must be positioned for taking up belt slack so that about a fifth of the total available movement is toward the driven unit, making it easy to put the belt on. The remaining belt movement will be available for take-up purposes. The belts should be rolled on the sheave by hand, not pried on with a bar, which may injure them. The entire set should be placed by hand in the grooves so that the slack of all the belts is either on top or on the bottom.

Belt tension must be uniform. A belt which appears to be snug in its sheave when the drive is idle will sag slightly on the loose side when running. New belts must be taken up after being "run in" for 48-hr., to avoid damage from heating due to slippage.

Heat is an enemy. Safety guards should be well ventilated to allow it to escape (the belts must not touch the guard or other object while in motion). The drive, moreover, should be kept away from radiators or other outside sources of heat to prevent overcuring, with cracking and breaking, which occurs at temperatures exceeding 140 deg. F. Reserve stocks of belts should be kept in a dry, cool, dark room. Rubber dries out if subjected to continuous heat.

To avoid side wear on the belts, the shafts of the pulleys and the sheave grooves must be properly aligned. The sheaves should be firmly keyed to their shafts so that they cannot slip sideways out of this alignment.

V-belt drives are usually designed to handle a specific load. To increase this by adding secondary drives will shorten the life of the primary belts.

Use of matched sets made up of belts all having the same length-range will increase the life of the drive. New belts should not be included with old belts in making up a set. It will be difficult, otherwise, to match them as to length. The old belts, moreover, may have a coefficient of friction quite different from that of the new ones, due to drying out and air-curing. Variations in cross-section, stretch characteristics, and elastic properties may also affect seriously the life of a set of mixed belts.

Belt dressing is taboo. It injures the belt. If there is slippage, the remedy lies in adjustment of the tension. Oil and grease are enemies of rubber. Leaky bearings which allow them to drip on to sheave and belt should be repaired (the sheave should be kept clean of dirt and dust as well). On the other hand, poorly lubricated bearings result in greater friction, which overloads the drive and shortens the belt life.

Acid fumes and excessive moisture are also enemies to be avoided. The standard belts are not intended to be used in their presence.

Lastly, discarded V-belts should be salvaged for emergency use. If not torn or ruptured, they can be pressed into temporary service when the occasion arises. A matched set can often be made up of old belts that have been used on the same drive.

Fire Hazard

RISKS necessarily attendent on the use of welding and oxyacetylene cutting should not be obscured by the great advantages of these practices. Carlessness can cause fires, and delay production. Flames, sparks, molten slag, and hot metal can all ignite combustible material. Cutting takes first place, according to the National Fire Protection Association, because sparks from the oxyacetylene torch carry further and are more likely to cause fires than those from gas or electric welding. At the same time, welding is an important cause. Both practices can be employed with safety if precautions are observed and the welder never takes a chance. Portable equipment is said to be the worst offender, being so often used in places where burnable materials are present. The welder and those about him must be prepared to put out fires.

The Extinguisher

FIRST AID FOR FIGHTING the starting fire is the extinguisher. It should be of approved make, close at hand, in good condition, ready for use. New ones will require high priority. Proper care for those in service is indicated in the following rules, suggested by manufacturers of such equipment and issued by Safety Research Institute:

Appoint a dependable man in charge of recharging and inspection.

Provide him with recharging materials and replacement parts supplied by the extinguisher manufacturer.

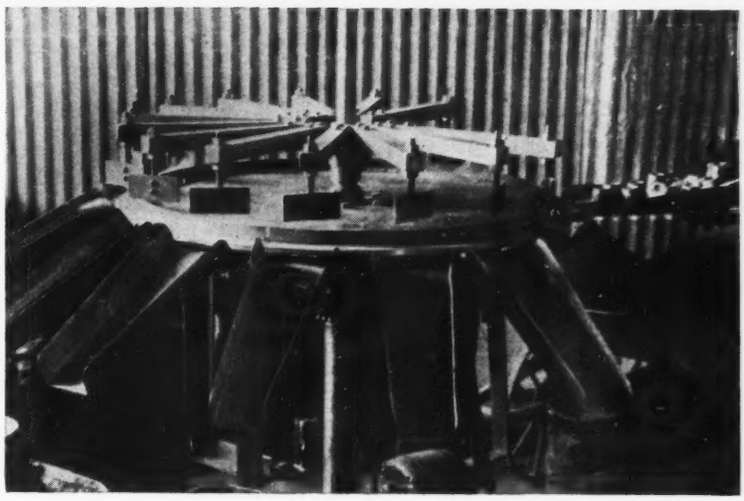
Give him a place to work where an abundance of hot and cold water is available.

Supply the tools he needs—buckets, mixing sticks, vaseline for the threads.

Then hold him accountable for the condition of the extinguishers.

Attention to this item of equipment may be the means of saving an entire plant from destruction at a time when it and its machinery are hard to replace.

Useful Operating Ideas



An Ingenious Bit-Sorting Machine

AN EFFECTIVE PIECE of machinery developed by John Myhre, shop foreman, and installed in the drill-bit manufacturing and repair shop of Anaconda Copper Mining Co., Butte, Mont., is the bit-sorting machine shown in the accompanying illustration. Its outstanding features are simplicity in design, automatic operation, and, because made from scrap materials, low first cost.

When considering the time consumed at the average drill-sharpening shop in sorting worn detachable bits by hand methods, the importance of the sorting machine is readily apparent. Essentially, the unit is made up of a simple frame made of angle irons and tubing, with bolted-on sheet-iron discharge chutes, a stationary steel star containing adjustable steel baffles, a circular revolving table, and a drive shaft with auxiliaries such as a worm gear, top bearing assembly, and foot bearing. Each baffle on the star is set 1/32 in. lower than the one preceding it.

Operation is simple and automatic. The worn detachable bits are fed by hand from a small storage bin onto the slowly revolving table and are carried around in single file until each strikes a baffle corresponding to its height, and is pushed off into the steel chute serving the storage container below. Power is supplied by a small electric motor through a worm-gear drive.

Quick Repair of Diesel Engine

AN INGENIOUS ARRANGEMENT of apparently inadequate tools whereby an emergency diesel engine repair was successfully accomplished is described by R. M. Gammell, Tucson, Ariz. The headbolts on a 100-hp., slow-speed diesel were being tightened when one of the bolts twisted off, the break occurring close to the cylinder block. No portable drilling equipment, air or electric, was available at the mine and, in fact, none was available within 85 miles of the mine property, and the only thing which might serve was a $\frac{5}{8}$-in. ratchet wrench and a drill bit slightly smaller than the stud bolt to be drilled out.

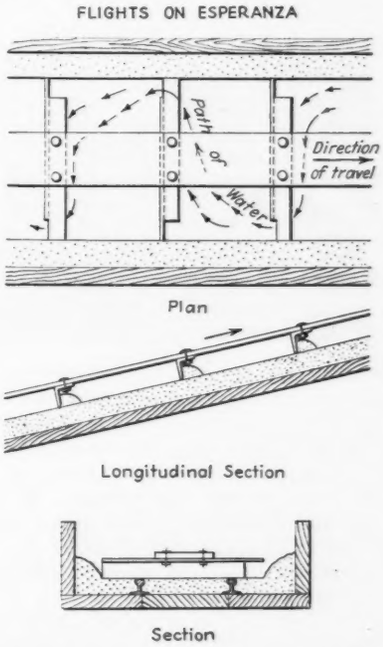
A $\frac{5}{8}$-in. nut was welded to the end of the bit so that the wrench could be used to rotate the drill, and a 3x6-in. timber, 8 ft. long, was used as a lever to apply pressure on the ratchet wrench. The top of the wrench faced against a washer counter-sunk into the timber in order to avoid cutting into the wood. The broken stud was drilled out in an hour and forty-five minutes.

Leaded Grease

THE SURFACE HOIST at Spring Hill Mine, Grass Valley, Calif., has an open train of gears which has been found rather difficult to lubricate, writes C. C. Cushwa, manager. During the hottest summer days the greases used would be thrown on the floor of the hoistroom, and in the coldest winter weather the same greases would form a hard film on the teeth, occasionally strong enough to be a menace to the meshing of the gears. Many weights of grease were tried, but none was found satisfactory until a special brand of leaded grease was used. This forms a very thin film which lubricates perfectly, does not thicken in winter, and does not soil the hoistroom floor in summer. It is recommended solely for open-gear trains, and is admirably adapted to that purpose.

Improved Esperanza Drag Classifier

VICTORY Fluorspar Mining Co., Elizabethtown, Ill., experienced difficulty in dewatering jig concentrate with Esperanza classifiers, according to Lehner Schwerin, general manager. Material packing along the sides of the trough prevented entrained water from flowing back down the trough into the classifier tank, and the water content of the concentrate was therefore excessive.

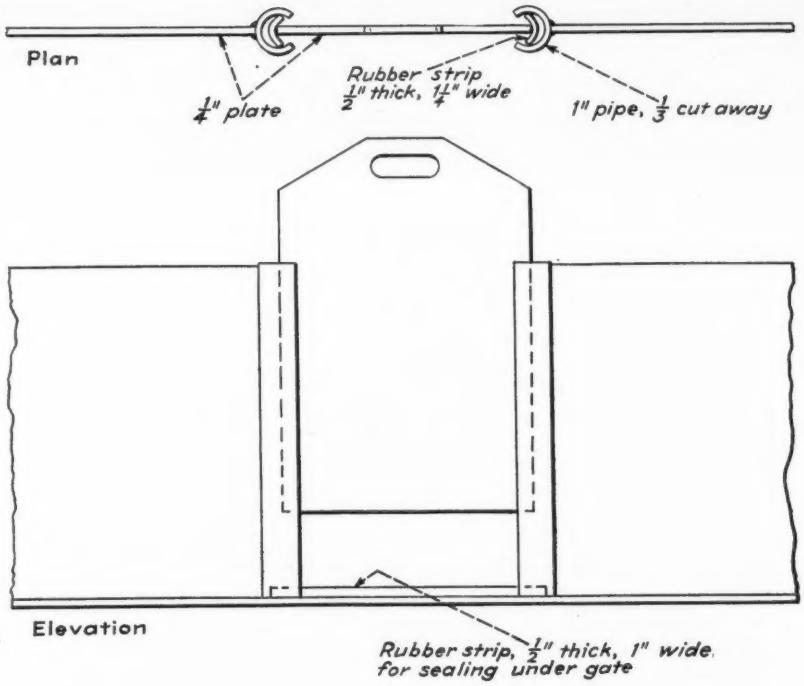


As shown in the accompanying diagram, alternate ends of the angle iron flights were cropped to allow a free, but zigzag, path for water drainage. Satisfactory concentrate was obtained thereafter. Small mine rails, placed in the drag trough, protect the trough bottom by providing a wearing surface against which the flights rest. When

the flights become worn, they are reversed on the belt so that double wear is secured.

Non-Sticking Control Gate

A STANDARD METHOD for many years of controlling pulp or liquid flow in mills has been by means of sliding gates set in launders or distributing boxes. Such gates, made of steel plate or wood, are normally mounted in rigid slides which cause them to seize after they have been left in one position for any length of time. R. D. Lord, mill superintendent of Preston East Dome Mines, Limited, South Porcupine, Ont., sends in the accompanying drawing of a non-sticking gate for this purpose. The rubber strips form a seal and act as springs which prevent the gate from binding when left in one position for a period of time.


Plan
1/4" plate
Rubber strip 1/2" thick, 1 1/4" wide
1" pipe, 1/3 cut away
Elevation
Rubber strip, 1/2" thick, 1" wide for sealing under gate

Novel Grinder for Reconditioning Circular Saw Teeth

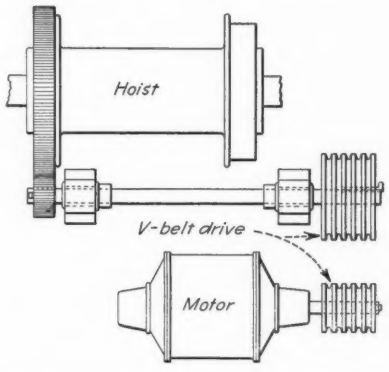
A TIME-CONSUMING JOB frequently done at the mine timber-framing shop is reconditioning teeth of circular saws. Many shops employ two types of saws—namely, saws fitted with inserted teeth, which, beyond periodical changing of teeth,

offer no serious maintenance problem; and units made from one solid disk of steel. On the latter, one of the most intricate repair jobs is readjustment of the depth of the teeth after a certain number of sharpenings. Much time and patience are required to turn out a satisfactory and effective product, especially if the work is done by conventional hand methods.

At the timber-framing shop of Phelps Dodge Corp., Copper Queen Branch, Lowell, Ariz., the task of reconditioning teeth of solid circular saws has been simplified materially since installation of the grinder shown in the accompanying illustration. Because of the adjustment features incorporated in its design, teeth uniform as to depth and angle can be turned out in a relatively short time. As will be seen, construction and operation of the unit differ but little from those of a swing saw. The grinding wheel proper is driven by a small electric motor, and can be raised and lowered by means of a simple lever arrangement. Safety features include a guard with glass visor covering the grinding wheel, and a small hood attached to the flexible pipe leading to the dust-collecting installation in the shop building. The completed grinder set-up was made from used materials at a low cost.

V-Belt Drive Replaces Gears on Mine Hoist

THE MECHANICAL DEPARTMENT of Mountain City Copper Co., Rio Tinto, Nev., was recently confronted with the problem of repairing quickly a winze hoist rendered useless by sudden breakage of the gear on



the motor drive. The gear itself was beyond repair, and exhaustive inquiry failed to locate a new one, because the hoist was not of standard make and the manufacturer was no longer in business. With no spare hoist available, there was no time to make a new gear at the shop or have one made to order at the factory. The difficulty was finally overcome quickly and economically by replacing the gear train with the V-belt drive shown in the accompanying sketch. It uses five belts, and has given satisfactory service in every way. A long shutdown of the winze was averted in this manner.

Dump-Buggy Used As Mine Car

TRANSPORTING and laying of ties and rails can be eliminated at least to some extent in the average small mine by use of the construction industry's two-wheeled rubber-tired dump-buggy, according to N. W. Sweetser, mining engineer of Glendale, Calif. They are light in weight, have a capacity of from 800 to 1,000 lb. of rock, and their first cost, new or second hand, is less than that of a small mine car. If desired, 2x6-in. planks can be laid loosely end to end to furnish a smooth track for the buggies, and the handling of material from isolated tunnels, crosscuts, and sublevels can be greatly facilitated.

In sinking small shafts where the collar set has been raised above the surface to allow increased dump height, the sinking bucket can be made to discharge directly into a dump-buggy, which is then used to spread the waste rock out around the shaft without aid of tracks or trestles.

Personal Items

W. A. Richelsen has returned to Seattle, Wash., from professional work in Mexico.

Edgar Y. Ellis, a mining engineer of Joplin, Mo., has joined the staff of the Tri-State branch of the RFC.

Sewell Thomas, mining engineer of Denver, Colo., has returned from a professional trip to Cuba.

George C. Bateman, has resigned as secretary of the Ontario Mining Association to devote his full time to his duties as Canadian Metals Controller.

John P. Burrows is now in charge of the Magnesium Chloride Division of International Minerals & Chemical Corp. at Carlsbad, N. M.

J. H. Evans, who has been managing the operations of the Lexington Mining Co. at Neihart, Mont., has resigned and moved to Spokane, Wash.

H. E. Zimmerman, vice president of the United States Steel Corp., Pittsburgh, Pa., has been reelected president of the American Standards Association.

H. L. Watson has become president of **De Laval Steam Turbine Co.,** Trenton, N. J., succeeding **Francis J. Arend,** who died Aug. 24, 1942.

John F. Thompson, executive vice president of The International Nickel Co. of Canada, Ltd., has been elected a director of The American Metal Co., Ltd.

H. A. Rose, formerly on the staff of Pioneer Gold Mines of B. C., Ltd., has been designated by Wartime Metals Corporation as manager of the Kootenay Florence project.

W. St. C. Dunn, stope engineer of Bralorne Mines, Ltd., and **V. M. Killeen,** of the Explosives Division of Canadian Industries, Ltd., have been commissioned in the Royal Canadian Engineers.

Robert E. Illidge, metallurgist and formerly mines superintendent for Eagle-Picher Mining & Smelting Co., has become plant manager for Kalunite, Inc., which will build a new aluminum plant.

Arthur S. Hecht, formerly mine superintendent at Cia Minas de Colquiri, has been transferred to the Bolsa Negra mine, La Paz, Bolivia, as general manager.

E. R. Shepherd, manager of B.R.X. Consolidated Mines, Ltd., Bridge River, B. C., has returned to the mine in Bridge River to investigate further an occurrence of scheelite discovered underground last summer.

Frank Cameron, general manager, La Luz Mines, Ltd., Siuna, Nicaragua, is on vacation in the United States. Until his return his address is 1300 Bankers Securities Bldg., Philadelphia, Pa.

H. B. Palmer, placer engineer of Nome, Alaska, has established permanent residence at Nenana, Alaska. At present he is engaged in field engineering work for the Army Engineer Corps and the Civil Aeronautics Administration.

Benjamin F. Tillson has been named A.I.M.E. representative on the Mining Standardization Correlating Committee of the American Standards Association for the two-year term ending Dec. 31, 1944.

A. M. Staehle, vice-president of the McGraw-Hill Publishing Co., has been appointed publisher of *Engineering and Mining Journal* and *Coal Age,* succeeding H. W. Clarke, who resigned effective Jan. 1, 1943. Mr. Staehle, who is also publisher of *Factory Management and Maintenance,* is a graduate of Carnegie Institute of Technology. Following graduation he was editor of *Coal Industry* and later employed by the Westinghouse Electric

A. M. STAEHLE

& Manufacturing Co. He joined McGraw-Hill in 1926 on the mining catalogs. Later he was successively manager of *Coal Age,* of the McGraw-Hill Construction papers, and of *Factory,* becoming publisher of the latter in 1938.

T. A. Oberhellmann has been appointed chief engineer of the Dixie Machinery Manufacturing Co., of St. Louis, Mo.

Ned H. Dearborn, of New York City, has succeeded **W. H. Cameron** as executive vice president and managing director of the National Safety Council, at 20 North Wacker Drive, Chicago, Ill.

A. W. Newberry is in charge of a Bureau of Mines project at Virgilina, Va. His home address is changed from Longmeadow, Mass., to 907 Longview Ave., Roanoke, Va.

Hal D. Draper, assayer and consulting chemist, Nevada City, Calif., has been appointed associate professor in chemistry at the Chico State College, Chico, Calif.

L. K. Fletcher, president and general manager of Newon Manganese Mining Co., Ltd., has returned to Toronto after examining several strategic-mineral occurrences in British Columbia.

Victor Pimentel, mining engineer of Reno, Nev., has been engaged for some months in investigation and appraisal for the government of mining claims in large areas in Nevada that have been condemned for the war duration for use as bombing ranges by the Army air forces.

Lucius W. Mayer, of the firm of Rogers, Mayer & Ball, is making a survey of heavy industrial scrap for the New York City Salvage Committee of the War Production Board.

W. L. Kendrick, of Coleraine, Minn., recently assistant superintendent of the Trout Lake concentrator of the Oliver Iron Mining Co., has been promoted to the post of superintendent, succeeding W. F. Ulrich, deceased.

Reed W. Hyde has been reappointed representative of the A.I.M.E. on the joint committee on Engineering Societies Monographs for the one-year term ending Dec. 31, 1943.

J. P. Hutchins has returned to San Francisco after being away for more than a month investigating deposits of chromite and of other strategic minerals on Cedros Island, off the west coast of Lower California.

Thomas T. Read, Vinton professor of mining engineering, Columbia University, has been appointed consultant in the education and allocation of engineers, Office of the Director of Operations, War Man Power Commission.

A. W. Burgren, for many years superintendent of various mines in Mexico, has for a considerable period been professionally engaged at the Mare Island Navy Yard, in California. His address is P. O. Box 53, Mt. Eden, Calif.

A. J. Clark has retired as metallurgical superintendent of the Homestake Mining Co. at Lead, S. D. He will be succeeded by **N. Herz,** his assistant since 1929. **R. J. Hall** becomes assistant superintendent. Mr. Clark has been with the Homestake since 1897.

R. Ruiz Bates has resigned his post with the Bolivian Tin & Tungsten Mines Corp., with which he had been associated for the past five years, to establish himself in his native land, Argentina, where his address will be Santa Fe 5255, Buenos Aires.

Neal M. Muir, formerly manager of the Nevada Minnesota Mining Co., at Gold Point, Nev., and recently with the geological department of the Utah Copper Co., is now at Hyder, Alaska, with the U. S. Bureau of Mines, on tungsten examination and exploration work.

N. E. McConnell, superintendent of Privateer Mine, Ltd., has resigned to commence active service with the Royal Canadian Engineers. He will be succeeded by **Harry Hewat,** present mine foreman. **Walter Lammers,** assistant engineer and geologist, will become head of the engineering staff.

Albert W. Davis, assistant secretary and assistant treasurer of the United States Potash Co., New York, has been elected to membership in the Controllers

Institute of America, a technical and professional organization of controllers devoted to improvement of controllership procedure.

B. B. Hood, Falls Church, Va., has recently transferred from the federal Public Housing Authority to the Reconstruction Finance Corp. He will be connected with the self-liquidating division that handles loans to mining and other industries. His headquarters will be in Washington, D. C.

A. E. Jukes, president of the B. C. Chamber of Mines and of Gold Belt Mining Co., Ltd., has been elected vice-president of Sheep Creek Gold Mines, Ltd., and its subsidiary Zincton Mines, Ltd., to succeed **C. E. Marr,** of Spokane, who was elevated to the presidency following the death of Rolf W. Bruhn.

J. J. Russell, secretary and treasurer of Revere Copper & Brass, Inc., New York, was elected a director of the Controllers Institute of America at that group's eleventh annual national meeting, held Sept. 21 to 23 at the Palmer House, Chicago.

George R. Heyl, formerly Assistant State Geologist of Arkansas and more recently in consulting work at Little Rock, Ark., is now a member of the United States Geological Survey, with headquarters at Salt Lake City, Utah. He is working on copper deposits in the foothills schist belt of the Sierra Nevada Mountains, in California. The project is a joint one with the Bureau of Mines, and he is in charge of the work for the Survey.

Everett L. Joppa, mining engineer for Pickands, Mather & Co. at the Mahoning mine, in Hibbing, Minn., has been promoted to superintendent of the Plymouth mine, at Wakefield, Mich. Mr. Joppa will be succeeded at the Mahoning by **Seval Sorenson,** who was formerly engineer at the Bennett mine, in Keewatin. **Hayden F. Sears** was transferred from the Dunwoody mine, at Chisholm, to succeed Mr. Sorenson at the Bennett, and **Robert T. Bell** will be engineer at the Dunwoody mine. All these properties are operated by Pickands, Mather & Co.

These two pioneers of Arkansas quicksilver mining, Leo Yount (right) and R. B. McElwaine, are now together, operating as the Arkansas Quicksilver Co.

Butler Bros. has announced several changes in operating personnel. **Earl Mollard** is now superintendent of operations for the Mesabi range. He was formerly superintendent for Butler Bros. on the Cuyuna range. **Clare E. McManus** has been promoted from assistant chief engineer to succeed Mr. Mollard on the Cuyuna range. **Bert A. Andreas** is made assistant chief engineer under **H. E. Reese. Philip R. Eldred** has been appointed manager of industrial relations, with headquarters at Cooley, Minn.

Franklin Farley, vice president and manager of the phosphate division of International Minerals & Chemical Corp., is in charge of the company's manganese operations at Chamberlain, S. D. Engineering development and operation of the experimental plant are under the supervision of **James A. Barr,** chief engineer. **Dr. P. D. V. Manning,** research director, is in charge of chemical research. **J. P. Magner** is finance manager. Operating headquarters have been established at Chamberlain. Professionally engaged there are **T. E. Casler,** project engineer, formerly with Phosphate Mining Co., and **Dr. I. M. LeBaron,** research engineer. Both are new members of the International organization.

Adolph W. Beck, Jr., has been appointed general superintendent of ore mines and quarriers for Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., succeeding **Edwin M. Ball,** who has retired. Mr. Beck, a native of Birmingham, attended the University of Alabama and graduated from the Colorado School of Mines. He was employed by the Tennessee company on Jan. 1, 1923, as underground engineer at Muscoda. Through a line of promotions leading from underground engineer to division engineer and then to chief engineer of the department, he was made assistant general superintendent on Jan. 1, 1942. Mr. Ball's retirement comes after many years of service with the company. He became superintendent of the Ishkooda Division of ore mines in 1912. He was transferred to the Wenonah Division as superintendent in 1923, and made general superintendent of ore mines and quarries the same year.

OBITUARY

George Dean Stone, mining engineer, died in San Diego, Calif., on Dec. 3 at the age of 78.

William Helsham Radford, 88, a retired mining engineer who had lived in California for 66 years, was killed by a railroad train on Dec. 22.

Henry Goodeve Sidford, vice president of the National Lead Co., who had been with the company for 53 years, died on Dec. 25 at Maplewood, N. J. He was 67.

Bryce W. Turner, a retired mining engineer who had formerly been identified with the Guggenheim and Schwab interests, died in New York on Dec. 25, at the age of 70.

Edgar Palmer, chairman of the board of the New Jersey Zinc Co. industrialist and philanthropist, died at Princeton, N. J., on Jan. 8 at the age of 62.

Sir Harry A. Miers, British geologist, and assistant at the British Museum from 1882 to 1895, when he became a professor of mineralogy at Oxford, died in London on Dec. 11 at the age of 84.

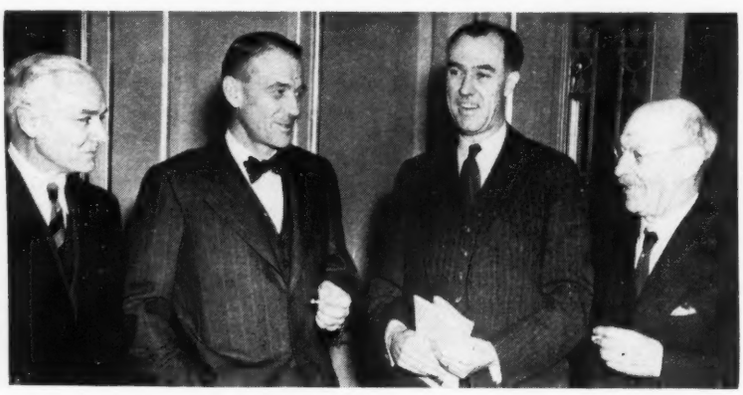
Robert Haven Gross, a leader in the development of United States copper and coal industries, died at Los Angeles on Dec. 20 at the age of 77.

Dr. Arthur P. Honess, mineralogist, who had been a member of the faculty of Pennsylvania State College for 25 years, died on Dec. 17. His age was 55.

Carroll M. Carter, mining engineer, Colorado pioneer, and president of Carter Mines Co., producer of gold, silver, and lead for more than 40 years, died at Ohio City, Colo., on Dec. 4 last. He was 71.

Harry L. Day, organizer of the Day interests in the Coeur d'Alene district of Idaho, died on Nov. 17 last at Santa Barbara, Calif. He was 76.

George Kingdon, 81, well-known copper mining man of the Southwest, and formerly with United Verde Extension Mining Co., died recently at San Diego, Calif.



This group of British Columbia mining men at the annual Western Meeting of the Canadian Institute of Mining and Metallurgy consists of (left to right): A. E. Jukes, president, B. C. Chamber of Mines; Hon. E. C. Carson, B. C. Minister of Mines; C. P. Browning, general manager, Britannia Mining & Smelting Co., Ltd.; and H. Mortimer-Lamb, secretary of the B. C. division of C.I.M.M.

Ellis H. Davies, director of mechanical equipment and materials supply to the Australian Allied Works Council, died on Oct. 2 last. In his early years Mr. Davies was associated with Messrs. Bewick Moreing & Co. and chief engineer to Messrs. Charles Ruwold Pty. Ltd.

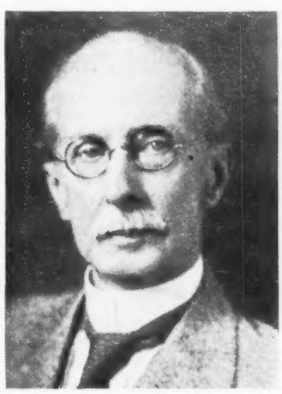
Donald E. Cummings, 42, a consultant on industrial hygiene as a field representative of Saranac Laboratories, of New York City, for years professionally prominent in the Iron Country, was killed on Dec. 15 when a transport plane on which he was a passenger crashed in Utah. He was a member of the faculty of the University of California.

William P. Chinn, 76, retired general manager of Pickands, Mather & Co., died Dec. 2, 1942, at his home in Duluth, Minn. After working in the mines in Michigan, he went to Tower, Minn., in 1884, and secured a position as a mine laborer in the Souden mine. He worked up to the position of general manager of all iron mines of Pickands, Mather & Co. in 1922. He retired in 1937, to be succeeded by **A. D. Chisholm.**

Robert Peele

An Appreciation

ROBERT PEELE, who died at his home in New York on Dec. 8, 1942, will be known to future generations of mining engineers (as he is to most of the present one) as the editor of "The Mining Engineers' Handbook," but by the many men who, between 1892 and 1925, studied under him he will be best remembered as their esteemed teacher. He was born in New York City, July 15, 1858, and graduated from Columbia School of Mines with the class of 1883. During the next ten years he had a varied and wide experience at gold and silver mines



ROBERT PEELE

in North Carolina, Arizona, and Colorado, and in examining properties in those states, New Mexico, and in Colombia and Dutch Guiana. Becoming superintendent of the Oregon Gold Mining Co., at Cornucopia, he was soon thereafter called back to South America as the examining engineer for the Peruvian Exploration Syndicate, of London.

At Columbia School of Mines Henry S. Munroe was made head of a separate department of mining engineering in 1891 and the first one of his former students whom he chose to assist him in building up the department was Robert Peele, who became adjunct professor of mining in February 1892. The rest of his life was spent as a teacher, since, although he was also for some fifteen years a partner in the consulting firm of Olcott, Corning, and Peele, his major interest was always in his educational work.

The courses he taught dealt principally with the application of machinery in the conduct of mining operations, and the design of mine plant, and as a byproduct of this he published, in 1908, "Compressed Air Plant," which has gone through many subsequent editions. His students will remember best, however, the summer schools of mining which were under his direction and where most of them got their first actual underground experience, with supervised instruction in the development of intelligent observation and analysis, and the accurate recording of data. No other institution had such a system for concentrated study of a single property, and it seems probable that the wide subsequent development of summer school work in all fields of education owes much to this pioneer work, which had developed out of the methods of European mining schools.

Becoming a full professor in 1904, he continued teaching until 1925 and meanwhile, in 1918, the first edition of his Handbook, in the preparation of which he enlisted the help of some twoscore engineers and scientists, most of them his former students, was issued. Becoming emeritus professor in 1925, his major activity in later years was the revising of the Handbook, of which a third edition appeared last year, and of "Compressed Air Plant." Characterized by a marked personal reserve, he was never particularly active in social affairs, yet the Mining and Metallurgical Society of America awarded him its gold medal in 1922 for his contributions to the literature of mining, and the American Institute of Mining Engineers made him an honorary member in 1935. He was a member of the Century and the Columbia University clubs. In 1939 Columbia University awarded him its Egleston medal for distinguished engineering service. He never married, so only his books remain to carry on the name and to quicken the recollections of the many who were privileged to know him.

THOMAS T. READ

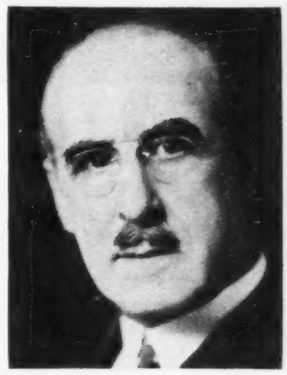
Dr. Frederick M. Becket

An Appreciation

DR. FREDERICK M. BECKET has passed away. Thus ends one of the outstanding personalities in the scientific world. But, Dr. Becket was much more than a great scientist. His personality was such as to endear him to all fortunate enough to cross his path. Indeed, the closer and longer the association, the higher the esteem in which he was held. He wore well.

So much has been written about his scientific attainments in connection with the bestowal on him of many medals and awards that they are a matter of record. Mankind's gain from his work is great and permanent, but it is the memory of a friendly, helpful, cordial, and, above all, gentlemanly personality that will always remain fresh in the minds of his friends.

His work dominated his career, but within the long hours of the busy day there was always time to help colleagues in many intimate and personal ways. No effort was too great if it eased the road for his associates, or led to better understanding of the work or better training of those who were working for



DR. FREDERICK M. BECKET

him. Indeed, his greatest delight was to watch men grow and to help them on to work of greater responsibility. His demand for thoroughness led to more kindly constructive criticism than praise, but if praise were deserved it was freely given. Such traits brought loyalty and affection of all who knew him, and developed an enthusiastic, highly cooperative organization around him. The results will continue long after his passing.

Even though brought about through business, his connections soon became personal and intimate, and were solidly cemented by friendliness, honesty, frankness, and a complete lack of interest in gain if at the expense of another. Characteristically, his charities were many, never advertised, and mostly of an intimate, personal nature.

His was a rugged, strong brain which knew no self-deception. He was sure of those things which he knew, and appreciated no less that about which he was not certain. A prodigious and highly accurate memory accounted for this attribute in no small measure. Demanding thoroughness and accuracy of himself, he was in a position to require it of others. No work left his hands that could be improved by further effort, and likewise none was accepted. He found much of life interesting and worth while, and his character was such that there was no room in it for the cheap and tawdry.

His scientific bent caused Dr. Becket to have a keen interest in the scientific side of medicine and its ally, psychology. Advances in nutrition and biochemistry were highly intriguing to him. More particularly, the study of psychology was of practical value as well as an absorbing interest. No doubt, it accounted for his keen judgment of char-

(*Continued on page* 108)

Summary of the MARKETS

EXCEPT for a few minor adjustments in prices for metals sold for shipment from established basing points plus freight to buyer's plant, to absorb a 3 percent transportation tax, the market for non-ferrous metals ended December with ceiling levels on major items unchanged. Demand for strategic metals during 1942 exceeded all estimates, yet the price structure, taken as a whole, was firmly controlled and the index scored what amounted to little more than a modest gain under extraordinary circumstances. The *E.&M.J.* weighted index of non-ferrous metal prices for 1942 averaged 86.80, which compares with 83.49 for 1941 and 79.22 for 1940. The index number for December, 1942, was 88.74, against 84.42 in the same month a year previous.

As 1942 ended the industry was surprised to learn that import duties on zinc, lead, molybdenum, and fluorspar had been reduced in a trade agreement with Mexico. Under war conditions, with virtually all imports in the hands

UNITED STATES MARKET

1942 Dec.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
26	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
31	11.775	11.700	52.000	6.50	6.35	8.25
AVERAGES FOR MONTH						
Dec.	11.775	11.700	52.000	6.50	6.35	8.25
AVERAGES FOR WEEK						
Dec.						
2	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
CALENDAR WEEK AVERAGES						
Dec.						
5	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25

SILVER, GOLD AND STERLING EXCHANGE

1942 Dec.	Sterling Exchange: "Checks" (Nominal)	Sterling Exchange: "90-day demand"	Silver: (c) New York	Silver: London	Gold: London	Gold: (d) United States
1	401.000	(f)	44.750	23.500	168s	$35.00
2	401.000	(f)	44.750	23.500	168s	35.00
3	401.000	(f)	44.750	23.500	168s	35.00
4	401.000	(f)	44.750	23.500	168s	35.00
5	401.000	(f)	(e)	(e)	(e)	35.00
7	401.000	(f)	44.750	23.500	168s	35.00
8	401.000	(f)	44.750	23.500	168s	35.00
9	401.000	(f)	44.750	23.500	168s	35.00
10	401.000	(f)	44.750	23.500	168s	35.00
11	401.000	(f)	44.750	23.500	168s	35.00
12	401.000	(f)	(e)	(e)	(e)	35.00
14	401.000	(f)	44.750	23.500	168s	35.00
15	401.000	(f)	44.750	23.500	168s	35.00
16	401.000	(f)	44.750	23.500	168s	35.00
17	401.000	(f)	44.750	23.500	168s	35.00
18	401.000	(f)	44.750	23.500	168s	35.00
19	401.000	(f)	(e)	(e)	(e)	35.00
21	401.000	(f)	44.750	23.500	168s	35.00
22	401.000	(f)	44.750	23.500	168s	35.00
23	401.000	(f)	44.750	23.500	168s	35.00
24	401.000	(f)	44.750	23.500	168s	35.00
25	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
26	401.000	(f)	(e)	(e)	(e)	35.00
28	401.000	(f)	44.750	23.500	168s	35.00
29	401.000	(f)	44.750	23.500	168s	35.00
30	401.000	(f)	44.750	23.500	168s	35.00
31	401.000	(f)	44.750	23.500	168s	35.00
AVERAGE FOR MONTH						
Dec.	401.000	.....	44.750	23.500	....	35.00
AVERAGES FOR WEEK						
Dec.						
2	401.000	.....	44.750	.....	....	.....
9	401.000	.....	44.750	.....	....	.....
16	401.000	.....	44.750	.....	....	.....
23	401.000	.....	44.750	.....	....	.....
30	401.000	.....	44.750	.....	....	.....

Calendar week averages, New York Silver: 5th, 44.750; 12th, 44.750; 19th, 44.750; 26th, 44.750.
(e) No quotation (Saturday). (f) Not quoted.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c per pound over the current market for Prime Western but not less than 1c over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for commond lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c per troy ounce. Handy & Harman's quotation on newly-mined domestic silver, 999 fine was 70⅝c. throughout December.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which at present is equal to $34.9125.

of the Government, tariff changes exert no influence on domestic prices of the materials involved. However, the move disturbed domestic producers largely because the action tends to make the future even more uncertain than it has been.

With consumption of copper in non-essential applications down to the minimum, available supplies may yet prove to be more than adequate for all war needs, many in the industry believed as the year closed. The Controlled Materials Plan is expected to stop all leaks in the use of copper, and stocking of metal for future consumption will end under the new regulations. Deliveries of copper to domestic consumers during the last quarter of 1942 were the largest on record. The ceiling price of 12c., Connecticut Valley, obtained throughout December. Some foreign producers of copper would like to obtain a higher price from Metals Reserve, but so far the sales basis has not been altered, holding at the equivalent of 11.75c., f.a.s. United States ports.

Domestic consumption of lead has improved in recent months. Trade authorities estimate that current production plus imports easily balance actual needs. At the same time, the reserve supply owned by Metals Reserve is said to be more than ample to meet any emergency. Some inequalities in basing-point prices fixed by OPA for Pennsylvania and elsewhere will be corrected in the near future. Quotations for common lead continued at 6.50c., New York, and 6.35c., St. Louis.

Zinc consumption in non-essential uses was reduced further during the last month. The industry at present is more concerned about the future concentrate supply than it is about capacity to produce the metal.

Antimony, sold ex warehouse New York, packed in cases, less than carload lots, advanced on Dec. 28 to 16.049c. per pound, reflecting the freight tax. Commercial indium has been reduced in price to $10 per troy ounce.

E & M J PRICE INDEX

Weighted index of non-ferrous metal prices. The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80

	1940	1941	1942
January	80.85	82.48	85.39
February	77.23	82.76	85.90
March	77.94	83.27	85.90
April	77.19	83.48	85.90
May	77.68	83.51	85.90
June	78.85	83.48	85.90
July	76.72	83.60	85.90
August	76.71	83.39	85.90
September	79.40	83.34	88.74
October	82.49	83.84	88.74
November	83.14	84.32	88.74
December	82.42	84.42	88.74

CURRENT PRICES—MISCELLANEOUS METALS, ORES, AND NON-METALLIC MINERALS

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(January 1, 1943)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 ton or more	16.049c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$36.00
Quicksilver, flask of 76 lb., 100 flasks or more	$196.00@$198.00
Radium, mg. radium content	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO. f.o.b. mines, ton	$35.00@$40.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.54
Manganese (dutiable) f.o.b. cars Atl. ports, long ton unit Mn:	
50 per cent	79.8c.
48 per cent	78.8c.
46 per cent	76.8c.
Manganese Ore, domestic, 48%, f.o.b. mines, l.t. unit	96c.@$1.00
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27.50c
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo; per ton	$55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.15

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 percent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, gross ton	$74.50
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1½ per cent C, gross ton	$135.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$750
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85–5 per cent, all rail movement, ton	$28.00
Ground, 95 @ 98 per cent, bulk, ton	$34.00
Acid, 98 and 1 per cent, bulk, ton	$35.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica, per lb., North Carolina, No. 1 and 2 quality:	
1½ x 2 in	90c. @$1.20
2 x 2 in	$1.50@$2.00
3 x 3 in	$2.00@$2.75
3 x 4 in	$2.50@$3.25
3 x 5 in	$3.00@$4.00
White, ground, ton	$60.00@$80.00
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

Monthly and Yearly Average Prices

SILVER AND STERLING EXCHANGE

	New York		London Spot		Sterling Exchange	
	1941	1942	1941	1942	1941	1942
January	34.750	35.125	23.273	23.500	(a) 402.000	(a) 401.000
February	34.750	35.125	23.341	23.500	(a) 401.864	(a) 401.000
March	34.750	35.125	23.446	23.500	(a) 401.788	(a) 401.000
April	34.750	35.125	23.500	23.494	(a) 401.058	(a) 401.000
May	34.750	35.125	23.457	23.500	(a) 400.981	(a) 401.000
June	34.750	35.125	23.400	23.500	(a) 401.000	(a) 401.000
July	34.750	35.125	23.397	23.500	(a) 401.000	(a) 401.000
August	34.750	35.125	23.459	23.500	(a) 401.000	(a) 401.000
September	34.750	44.750	23.500	23.500	(a) 401.000	(a) 401.000
October	34.750	44.750	23.500	23.500	(a) 401.000	(a) 401.000
November	34.772	44.750	23.500	23.500	(a) 401.000	(a) 401.000
December	35.125	44.750	23.500	23.500	(a) 401.000	(a) 401.000
Year	34.783	38.333	23.439	23.500	(a) 401.224	(a) 401.000

New York quotations for silver other than newly-mined domestic, cents per ounce troy, 999 fine. London pence per ounce sterling silver 925 fine. Sterling exchange (pound sterling) in cents. (a) Nominal.

COPPER

	F.O.B. Refinery, Electrolytic			
	Domestic		Export	
	1941	1942	1941	1942
January	11.819	11.775	10.257	11.508
February	11.794	11.775	10.414	11.700
March	11.814	11.775	10.592	11.700
April	11.820	11.775	10.952	11.700
May	11.815	11.775	10.950	11.700
June	11.810	11.775	10.950	11.700
July	11.812	11.775	10.950	11.700
August	11.778	11.775	10.950	11.700
September	11.775	11.775	11.027	11.700
October	11.775	11.775	11.367	11.700
November	11.775	11.775	11.200	11.700
December	11.775	11.775	11.200	11.700
Year	11.797	11.775	10.901	11.684

New York quotations, cents per pound.

LEAD

	New York		St. Louis	
	1941	1942	1941	1942
January	5.500	6.275	5.350	6.125
February	5.602	6.500	5.452	6.350
March	5.765	6.500	5.613	6.350
April	5.850	6.500	5.700	6.350
May	5.850	6.500	5.700	6.350
June	5.850	6.500	5.700	6.350
July	5.850	6.500	5.700	6.350
August	5.850	6.500	5.700	6.350
September	5.850	6.500	5.700	6.350
October	5.850	6.500	5.700	6.350
November	5.850	6.500	5.700	6.350
December	5.850	6.500	5.700	6.350
Year	5.793	6.481	5.643	6.331

New York and St. Louis quotations, cents per pound.

TIN

	Straits New York		Standard, Spot London	
	1941	1942	1941	1942
January	50.154	52.000	256.648	(b)
February	51.293	52.000	264.975	(b)
March	52.067	52.000	270.131	(b)
April	51.981	52.000	269.775	(b)
May	52.166	52.000	267.534	(b)
June	52.685	52.000	262.750	(b)
July	53.481	52.000	258.272	(b)
August	52.385	52.000	257.013	(b)
September	52.000	52.000	256.364	(b)
October	52.000	52.000	255.842	(b)
November	52.000	52.000	256.713	(b)
December	52.000	52.000	(a) 257.625	(b)
Year	52.018	52.000	261.137	.....

New York quotations, cents per pound. London, pounds sterling per long ton. (a) Average of 6 days; quotations suspended Dec. 9. (b) Not quoted.

ZINC

	St. Louis			
	1939	1940	1941	1942
January	4.500	5.644	7.250	8.250
February	4.500	5.534	7.250	8.250
March	4.500	5.750	7.250	8.250
April	4.500	5.750	7.250	8.250
May	4.500	5.803	7.250	8.250
June	4.500	6.235	7.250	8.250
July	4.516	6.250	7.250	8.250
August	4.719	6.389	7.250	8.250
September	6.104	6.920	7.250	8.250
October	6.500	7.250	7.942	8.250
November	6.500	7.250	8.250	8.250
December	5.980	7.250	8.250	8.250
Year	5.110	6.335	7.474	8.250

St. Louis quotations, Prime Western, cents per pound.

CADMIUM AND ALUMINUM

	Cadmium		Aluminum	
	1941 (a)	1942 (a)	1941	1942
January	80.000	90.000	17.000	15.000
February	82.273	90.000	17.000	15.000
March	89.038	90.000	17.000	15.000
April	90.000	90.000	17.000	15.000
May	90.000	90.000	17.000	15.000
June	90.000	90.000	17.000	15.000
July	90.000	90.000	17.000	15.000
August	90.000	90.000	17.000	15.000
September	90.000	90.000	17.000	15.000
October	90.000	90.000	15.000	15.000
November	90.000	90.000	15.000	15.000
December	90.000	90.000	15.000	15.000
Year	88.443	90.000	16.500	15.000

Aluminum in cents per pound, 99 plus per cent grade. Cadmium, cents per pound. (a) Producers' price, commercial sticks.

ANTIMONY, QUICKSILVER, AND PLATINUM

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) New York	
	1941	1942	1941	1942	1941	1942
January	14.000	14.000	165.846	202.519	36.000	36.000
February	14.000	14.000	170.182	197.272	36.000	36.000
March	14.000	14.602	177.692	197.050	36.000	36.000
April	14.000	15.991	180.077	197.098	36.000	36.000
May	14.000	16.013	180.000	197.300	36.000	36.000
June	14.000	16.013	183.920	194.282	36.000	36.000
July	14.000	16.013	188.577	194.430	36.000	36.000
August	14.000	16.013	192.000	194.430	36.000	36.000
September	14.000	16.013	192.440	194.430	36.000	36.000
October	14.000	16.013	193.615	195.346	36.000	36.000
November	14.000	16.013	196.273	196.000	36.000	36.000
December	14.000	16 019	199.654	196.000	36.000	36.000
Year	14.000	15.559	185.023	196.346	36.000	36.000

(a) Antimony, cents per pound, ordinary brands, in cases; in bulk f.o.b. Laredo, Tex., 14.500 for Nov.; New York equivalent 15.509. (b) Quicksilver dollars per flask of 76 lb. (c) Platinum, per ounce troy.

PIG IRON

	Bessemer		Basic		No. 2 Foundry	
	1941	1942	1941	1942	1941	1942
January	24.50	24.50	23.50	23.50	24.00	24.00
February	24.50	24.50	23.50	23.50	24.00	24.00
March	24.50	24.50	23.50	23.50	24.00	24.00
April	24.50	24.50	23.50	23.50	24.00	24.00
May	24.50	24.50	23.50	23.50	24.00	24.00
June	24.50	24.50	23.50	23.50	24.00	24.00
July	24.50	24.50	23.50	23.50	24.00	24.00
August	24.50	24.50	23.50	23.50	24.00	24.00
September	24.50	24.50	23.50	23.50	24.00	24.00
October	24.50	24.50	23.50	23.50	24.00	24.00
November	24.50	24.50	23.50	23.50	24.00	24.00
December	24.50	24.50	23.50	23.50	24.00	24.00
Year	24.50	24.50	23.50	23.50	24.00	24.00

Iron, dollars per long ton. F.o.b. Mahoning and Chenango Valley furnaces.

NEWS OF THE INDUSTRY

New Trade Treaty With Mexico Reduces Several Mineral Duties

Lead, zinc, fluorspar, graphite, molybdenum, arsenic, and antimony affected. Some rates increased after "unlimited national emergency"

ON DEC. 23, the Department of State announced the signing of a new trade agreement with Mexico, effective 30 days after being proclaimed by the President, which reduces import duties imposed under the Tariff Act of 1930 on several minerals and mineral products. The agreement is effective for a period of three years, and thereafter until six months after either government serves notice of intention to terminate. A novel feature of the treaty is a provision to restore the present duty rates in whole or in part on some items "thirty days after the termination of the unlimited national emergency proclaimed by the President of the United States of America on May 27, 1941."

As in all previous trade treaties, unconditional most-favored-nation treatment is granted to all countries not blacklisted, which in effect grants the rights given Mexico to all other countries with which we are not at war. The agreement contains the usual "escape clauses" which are best known to the mining industry for their never having been utilized, even when the specified conditions have developed.

The tariff rates involved on mine and smelter products are shown in the following table:

Product	Present Rate	New Rate	Post Emergency Rate
Zinc oxide, not over 25 percent lead, dry, cents per lb.	1.75	1.10	No change
Ditto, in oil	2.25	1.50	No change
Zinc sulphate, cents per lb.	0.75	0.50	No change
Fluorspar, 97 percent plus CaF_2, dollars per ton	5.60	4.20	No change
Fluorspar, 97 percent minus CaF_2, dollars per ton	8.40	6.30	No change
Graphite, amorphous, percent ad valorem	10	5	No change
Molybdenum ore or concentrates, cents per lb. of contained moly	35.0	17.5	No change
Lead, in ore, dust, and mattes, cents per lb. of contained lead	1½	¾	1⅓
Lead bullion, scrap, and alloys, cents per lb. of contained lead	2⅛	1 1/16	1 7/16
* Zinc-bearing ores, cents per lb. of contained zinc	1⅓	¾	1⅓
*Zinc slabs and dust, cents per lb.	1⅔	⅞	1⅔
Zinc sheets, cents per lb.	2	1	2
Zinc sheets, bright metal plated, cents per lb.	2¼	1⅛	2¼
Zinc, old, dross, skimmings, etc., cents per lb.	1½	¾	1½
Antimony ore	Bound on free list.		
Arsenious acid or white arsenic	Bound on free list.		
Metallic drosses, skimmings, dusts, and residues, not otherwise provided for	Bound on free list.		

* Note: Zinc in ore and slab zinc were reduced from 1.50 and 1.75 cents per lb. of contained zinc, respectively, in the revised Canadian trade treaty.

Special Notice to Subscribers of E. & M. J.

BEGINNING with the February number, readers of Engineering and Mining Journal will observe that the "trim size" of the magazine is slightly smaller than that of previous numbers. The reduction in size has been made to enable the publishers to meet an order of the War Production Board limiting the amount of paper that may be used in 1943. Subscribers will note, however, that no change has been made in size of type or in the amount of editorial content per page, but that a substantial saving in paper has been effected merely by trimming the margins.

The publishers have adopted the new size as a war measure and as a contribution to the conservation of manpower and transportation facilities in the production and distribution of paper. Service to the reader has not been sacrificed and will be maintained as far as humanly possible in the face of the problems confronting all of us in our united efforts to win the war.

Supreme Court Denies Percentage Depletion

ON DEC. 7, the U. S. Supreme Court announced its decision on Mother Lode Coalition Mines Co. vs. Helvering, in which the company sought to establish its claim to a percentage depletion allowance on a 1935 income-tax return. The court sustained the lower court in denying the company the right to use percentage depletion.

Decision was based on the circumstance that the Revenue Act of 1934 required the taxpayer to elect percentage depletion on his first return with respect to a property if percentage depletion was to be utilized. The appellant, a gold-mining company, had no net income in 1934, and therefore had no basis for computing a depletion allowance. It claimed percentage depletion in 1935, on the assumption that "first return" meant the first return in which depletion could be claimed.

This case is representative of a number of similar instances of confusion over the meaning of the percentage depletion provisions of the 1934 law.

WLB Disapproves Unlimited Escalator Clauses

IN A DECISION announced Dec. 3, the War Labor Board disapproved an escalator clause in a labor agreement between the Pyrites Company, Wilmington, Del., and the International Union of Mine, Mill and Smelter Workers, CIO, because it would have resulted in a general wage increase which would have brought the straight time rates of the company's 186 employees above 15 percent over the level of Jan. 1, 1941.

"The employees of the Pyrites Company," Dr. George W. Taylor, vice chairman of the board, said in writing the board's opinion on the case, "have received general increases of 19 percent over their straight-time hourly earnings of January, 1941. Under the wage stabilization program they have no proper claim, therefore, for further increases in wage rates as a cost of living adjustment. Nor can the escalator clause of the agreement between these parties serve to provide an additional cost-of-living adjustment in wages which is incompatible with the national stabilization program."

Dr. Taylor in his opinion made it clear that the board's decision in this case did not preclude the operation of escalator clauses. He explained that "such clauses will be given effect to the extent that they provide straight time rates not more than 15 percent above the January 1, 1941, rates."

Treasury to Lend-Lease Silver to British

GREAT BRITAIN AND AUSTRALIA have requested that the United States government lend-lease them supplies of silver for coinage until after the war. The borrowing country will agree to return an equivalent amount of silver when the war is over. Meanwhile, these countries need a greatly increased supply of silver coins because of the great numbers of soldiers billeted within their borders. Counsel for the Treasury advises that it is permissible for the Treasury to comply with the request.

In releasing this information, Secretary Morgenthau reiterated his opposition to the laws which guarantee a monetary status for silver.

OPA Provides for Flexible Treatment of Metals and Minerals

Will consider price adjustments to meet rising production costs of materials listed by WPB as essential but insufficient for war needs

TO PROVIDE for price adjustments necessary to prevent or relieve shortages and loss of essential production of specified metals, minerals, and metal and mineral products, or to keep high-cost producers in operation, on Dec. 26 the Office of Price Administration broadened the scope of price adjustment provisions for a specified list of these commodities.

On application or by its own motion, OPA may make price adjustments on the basis of evidence showing either:

1. That a shortage exists or is threatened in the essential supply of a listed commodity, and that its producer is unable to maintain or expand production at his prevailing maximum prices; or

2. That loss of a supplier's production of a listed commodity would force his customers to resort to higher-priced sources of supply, and that the producer is unable to continue operations under his existing price ceilings.

The metals affected are those on the War Production Board's Group 1, substitute and supply list (materials vital to the war effort of which the supply is inadequate). They include aluminum oxide, asbestos fibers, celestite, corundum ore, corundum grain, cryolite, graphite, iridium, kyanite, quartz crystals, quartz crystal products, tantalite, tantalum, and others.

In the first instance OPA may adjust prices by an amount necessary to assure the maintenance or expansion of such production and provide for a reasonable operating margin. In determining the "reasonable margin," OPA will take into consideration all data pertaining to revenues and the costs of production, exclusive of federal and state income taxes.

In the second instance, where the supply situation is less critical and essential, OPA, to prevent the loss of low-priced output, may adjust a producer's maximum prices to cover operating costs. In no such case, however, will the adjusted maximum prices be above the general level of prices prevailing for alternative sources of the supply. The items included in "operating cost" are labor, maintenance, supplies, power, taxes, insurance, workmen's compensation, royalties and other direct expenses, depreciation, and depletion. Also taken into consideration are reasonable costs of selling and administration.

To expedite action on applications for relief, applicants may obtain from OPA's Washington Office a description of the information which should be offered in support of price adjustment requests.

Materials subject to this treatment include "non-ferrous metals, ferro-alloying metals, and non-metallic minerals, their ores, concentrates, and products" but are confined to those "for which no other price regulation is in effect at the time an application for adjustment is filed." Thus, copper, zinc, and lead are excluded by virtue of being subject to the premium-quota plan. Magnesium, aluminum, tin, cadmium, French process zinc oxide, restricted grades of bauxite, sheet mica, spodumene, and steatite talc are on the latest published list of Group 1 materials but are not mentioned in the official release, presumably being subject to special regulation.

Steel Producers to Cut Fluorspar Consumption

THE WAR PRODUCTION BOARD has announced conclusion of a voluntary agreement by steel producers to reduce their 1943 consumption of fluorspar by 10 to 15 percent under the 1942 rate. This action was taken to avoid an expected shortage of 50,000 tons of metallurgical-grade fluorspar in 1943.

The fluorspar section of WPB is exerting itself vigorously to increase imports and stimulate domestic production of fluorspar. About 80 percent of the national output now comes from the Kentucky-Illinois fluorspar district, which has suffered a loss of productivity because of losses of labor to the Army, military construction, and war plants.

According to WPB, every Flying Fortress represents a consumption of 1,500 lb. of fluorspar and every 27-ton tank 150 lb.

The WPB's program to increase the amount of fluorspar available to American industry includes arrangements with the Board of Economic Warfare and the Metals Reserve Co. to import foreign spar in substantial quantities from Mexico and Newfoundland. In normal times, the United States supplied most of its own needs easily.

Domestically, price revisions have been made upward to encourage production. Average prices paid for the metallurgical grade have recently been increased by about $3 a ton, the 85 percent calcium fluoride-5 percent silica spar now bringing $28 a ton in Illinois and Kentucky.

Extensive explorations are being made by the U. S. Bureau of Mines and the U. S. Geological Survey to uncover new deposits. Drilling has been completed on several important new sources in the West, and the WPB is assisting in the development of projects in Illinois, Kentucky, New Mexico, Colorado, Utah, and Idaho. These new projects are expected to account for upwards of 40,000 tons of new fluorspar production per year.

Board Elections Unionize Several Operations

PURSUANT TO ELECTIONS held by the National Labor Relations Board, the United Steelworkers of America, CIO, has been certified as bargaining agent for employees of the Columbia Iron Mining Co., Iron Mountain, Utah; the Oliver Iron Mining Co., Marquette and Virginia-Eveleth districts; the Montreal Mining Co. (Gogebic Range); the Sherwood mine of Inland Steel Co. (Menominee Range); and the Cliffs Shaft and Lloyd mines of Cleveland-Cliffs Iron Co. (Marquette Range).

Evans-Wallower Zinc, Inc., was ordered to "cease and desist," to pay $15,477 to 14 claimants, and to reinstate nine claimants. This order relates to an alleged strike which took place in the Tri-State district in 1935.

Employees of the Hillside Fluorspar Mines, Marion, Ky., voted against certification of District 50, United Mineworkers of America, as their bargaining agent.

WPB Relaxes Gold-Mine Shutdown Order

ON DEC. 8, the War Production Board announced that it had granted several gold mines, which had been forced to shut down by its gold-mine closing order, permission to operate "for a limited time" provided operations would not consume substantial amounts of critical materials and would employ only "elderly or infirm" men. WPB announced that the order freezing gold-mining machinery did not apply to operations that had been shut down since Sept. 17, 1941.

Montana Mining Ass'n to Meet in January

ANNOUNCEMENT has been made by A. J. Strojan, of Helena, president of the Mining Association of Montana, that the association will hold its annual convention at Helena on Jan. 19. The convention will last one day only. There will be two business sessions, one at 10 a.m. and the other at 1:30 p.m. The afternoon session will be a question-and-answer discussion, with officials of federal and State agencies dealing with mining available to answer any questions that may be brought up. The convention will wind up with an all-Montana stag banquet, with members of the State legislature as guests.

U. S. Buys Canadian Gold Coins for Africa

ACCORDING to Treasury Secretary Morgenthau, when a supply of gold was needed for use by the United Nations forces in Africa, the Treasury was compelled to purchase gold coin from Canada, as this country no longer possesses gold coins. American gold currency was melted down when the United States quit the gold standard domestically.

STEPPING STONES TO VICTORY!

EACH landing we make, each enemy position we capture is a stepping stone toward Victory. Each is part of a great chain, leading to Berlin, Rome, and Tokio. But remember, the men who tread this path need backing from all of us at home.

For example, strict conservation of batteries is vitally important . . . and the four simple rules for battery care may be compared to stepping stones. Follow them to make batteries last. Buy to last and save to win.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

FIRST STEPPING STONE—Keep adding approved water at regular intervals. Most kinds of local water are safe in an Exide Battery. Ask us if yours is safe.

SECOND STEPPING STONE—Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.

THIRD STEPPING STONE—Keep the battery fully charged—but avoid excessive overcharge. There's always a right way to do any job and a storage battery will last longer when charged at its proper voltage.

FOURTH STEPPING STONE—Keep records of water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Know what's happening!

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for Booklet Form 1982.

Exide
IRONCLAD
BATTERIES

Trouble-Free Service and Maintenance Time Saving Make This a War Time Pump . . . . . .

The drain on man-power and the need for 3-shift operation day after day call for equipment such as the Amsco-Nagle Centrifugal Pump to minimize replacements and attention.

Made in two distinct units, the water end and the bearing stand, the complete assembly has the rigidity and alignment of single unit design and the flexibility of a "tailor-made" pump. Mounting the water end on the bearing stand by means of tubular supports insures the accurate alignment necessary for easy replacement and efficient operation. The bearings are remote from the abrasive or corrosive materials the pump is handling, and no part of the pump structurally important is otherwise exposed to corrosive abuse.

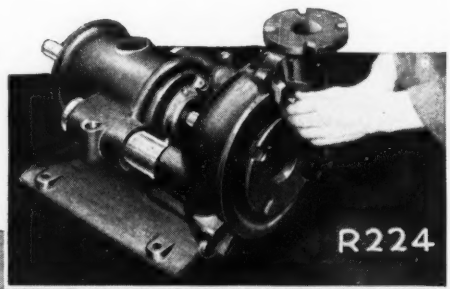
The clamp lug method of fastening the side plate in place in the casing affords quick access to internal parts. The impeller is usually screwed on to the shaft even when manganese steel or other materials difficult to machine are employed.

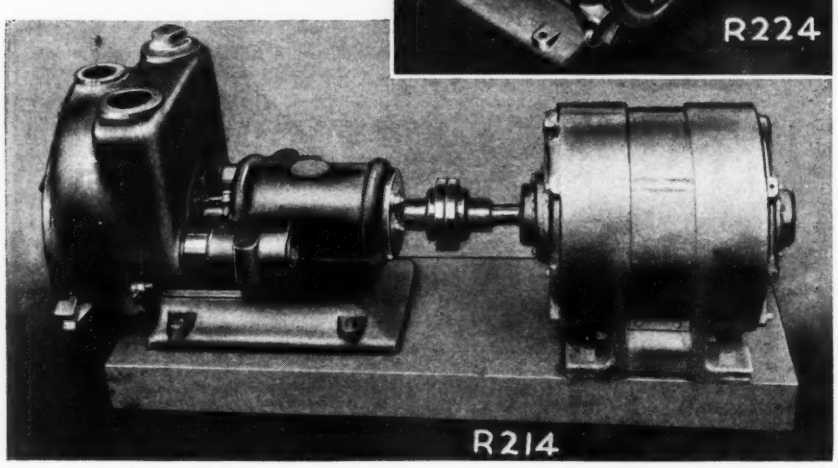
Another advantage of the Nagle design is the accessibility of the stuffing box made possible by the tubular method of assembling. Two corrosion-resisting nuts, accessible either from below or above, with abundant room for adjustment, are provided. Packing glands are made with precision to insure evenly distributed pressure and accurate adjustment. Water ends can be made of alloys suitable for almost any metal mining application. Our many years' experience in applying impact and abrasion resistant manganese steel and heat and corrosion resistant chromium-nickel alloys, as well as non-ferrous alloys, is of value here. Amsco-Nagle pumps are made in sizes from 3/4" to 16" discharge, with impellers up to 38" diameter, having capacities to 12,000 gallons per minute, and for heads up to 200 feet.

Among the oil refineries, chemical and chemical process factories, rock products plants, sand handling systems and other industrial applications where our pumps are employed, problems have been solved by these pumps very likely similar to your own.

Right: Clamp lugs permit quick removal of side plate on this Amsco-Nagle 2" type "T" horizontal shaft pump. Below: Note method of mounting unitary water end on bearing stand by means of lock-in-place tubular supports. A type "A" 1-1/2" self-priming pump.

These design features are characteristic of other Amsco-Nagle Pumps, both horizontal and vertical shaft types.





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OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
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Power Shovel Dippers. Dredge and Industrial Pumps
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OFFICES IN PRINCIPAL CITIES

NEVADA

Wage Increase Affects Pioche Mines

United Tungsten completes new mill at Toy—Copper Queen mine being rehabilitated—New Harold's Club mill may handle tin ore

▶ Although short-handed, the Desert Silver, Inc., Fred E. Gray, of Nivloc, manager, has maintained nearly normal output from its Nivloc mine and 225-ton cyanide mill, in Esmeralda County, largest producer of silver in Nevada during recent years. The company has been granted a serial number under WPB Order P-56 but is in need of miners.

▶ In a joint statement, Basic Magnesium and the A. F. of L. announced the conclusion of a labor contract covering more than 5,000 workers in the Basic Magnesium plant. The agreement names the A. F. of L. as sole bargaining agency for the employees, grants double time on the seventh day of a work week, and provides for wage rates ranging from 80c. to $1.50 per hour. This is the largest labor agreement in Nevada's history.

▶ Mining claims, buildings, some old equipment and town lots in Virginia City, owned by the historic Union Consolidated Mining Co., and at the north end of the Comstock lode, were sold for $1,500 recently to the Monitor Pipe & Steel Co., of Reno. The mine, opened to a depth of over 2,900 ft., produced over $4,000,000, chiefly in silver.

▶ A wage increase of 80c. per working shift has been granted by the Denver agency of the WLB to employees at three mines in the Pioche lead-zinc-silver district in Lincoln County. Mines affected are those of the Combined Metals Reduction Co., Bristol Silver Mines Co., and Prince Consolidated Mining Co. Combined Metals, 90 percent owned by National Lead Co., operates a 400-ton selective flotation mill on its own ore and that of the Prince Consolidated.

▶ A new tungsten mill completed by the United Tungsten Mines, Ltd., near Toy, a Southern Pacific station in Pershing County, is delivering concentrate to the Metals Reserve Co. stockpile at Salt Lake City for the plant under construction by the U. S. Vanadium Corp., acting as Metals Reserve agent. The mill, now treating 50 tons per day, is to have its capacity increased to 120 tons, and custom ore will be accepted under an arrangement with U. S. Vanadium. R. F. D. LeMon, of Lovelock, is president and manager; J. B. Berger, San Francisco, is secretary-treasurer; and Ray Tremp, vice-president of Triumph Explosives, Elkton, Md., is a director. Scheelite is supplied from four mines.

▶ Two producing silver-gold mines on the Comstock Lode at Virginia City, just below Gold Hill, have been given permission to continue operating, under a ruling by WPB, provided they employ only miners who are over the draft age. Properties are the Crown Point mine and 125-ton cyanide mill of the Sutro Tunnel Coalition, Inc., and the Overman mine

and 400-ton cyanide mill of the Consolidated Chollar, Gould & Savage Mining Co. J. M. Leonard, Virginia City, is manager at the Crown Point and F. V. Dempsey is superintendent at Gold Hill for the Consolidated Chollar enterprise.

▶ A steel headframe, electric hoist, compressor, and other units have been shipped by the Central Eureka Mining Co. from its closed gold mine at Sutter Creek, Calif., to the Copper Queen mine, which, with several adjoining copper-gold properties at Copper Basin, 7 miles southwest of Battle Mountain, in Lander County, was acquired recently under option for Central Eureka by its president, C. C. Prior, of San Francisco. Directing work at Copper Basin is Arthur Notman, with offices at Battle Mountain. Situated near the Copper Canyon mine, now an Anaconda unit, properties to be developed by the Central Eureka Mining Co. and now being prospected by drilling, include the Copper King, Gold Coin, Basin Hawkeye, No Money, and other claims, some of which have made substantial surface production of shipping ore.

▶ An examination and sampling of the old Mount Hope zinc-lead mine in Eureka County, 32 miles northwest of the town of Eureka and one mile from a rail point, has been completed by John Conrow, geologist of the Montana Bureau of Mines. Interest attaches to the property at present because of the presence of cadmium in considerable quantity in the ore, which is principally sphalerite. High-grade ore was produced around 1933 by the present owner, Universal Exploration Co., an operating subsidiary of U. S. Steel.

▶ Smelter returns for a 50-ton car of copper ore from the Garfield, Utah, plant of the A.S.&R. gave metal contents of 9.92 percent copper, 10.75 oz. silver per ton, and 0.72 percent tin. No payment was made for tin, which is not recovered in smelting copper ore. The ore was mined from the main fault zone of the Greenan-Kerr copper-tin property at Majuba Hill, Pershing County. A body of cassiterite, ranging from low-grade to masses sampling 40 to 50 percent tin, is being developed in and near the copper zone.

▶ Equipment for a 50-ton flotation mill has been delivered at the Last Chance lead-zinc-silver property, west of Imlay, in Pershing County, acquired, equipped, and under development by the Harold's Club Mining Co., with main offices in Reno. Plant construction will begin at once, and tests are being conducted at Salt Lake City to ascertain if the plant can be adapted to concentration of tin ore from the Greenan-Kerr mine, a mile distant. The Harold's Club Co. has also completed installation of a 30-ton rotary furnace, purchased from H. W. Gould & Co. and in use earlier at Gould's Mt. Tobin cinnabar mine, in eastern Pershing County. This furnace has been installed in the partly dismantled plant of the Nevada Quicksilver Mines, Inc., formerly the State's largest mercury producer, the large property of which has been acquired by the Harold's Club Co., which is trucking scheelite from its property 6 miles from the Getchell mine to that property. Ervin J. Young is directing engineer.

ALASKA

Alaska Highway Will Serve Mines

Promising antimony prospect on Tok River —Only one gold mine still operating— Anchorage office is receiving strategic minerals

▶ The new Alaska highway promises to be useful to the mining industry. Some mines which are within easy reach of this new thoroughfare expect to be able to use it in shipping out their ore on the backhaul of trucks which bring military supplies into the Territory. Sam Gamblin expects to use the highway in this manner to ship out high-grade antimony from his property on the Tok River, 15 miles from the road. Several government mining engineers examined the property last summer. Gamblin says his vein has been opened to a width of 12 ft., with half of it carrying 20 to 30 percent stibnite and the other 6 ft. good milling ore. In another 40 ft. the vein is 8 ft. wide, with 20 in. of 27 percent stibnite ore and the remainder good milling ore. He has traced the vein 300 ft. across the creek.

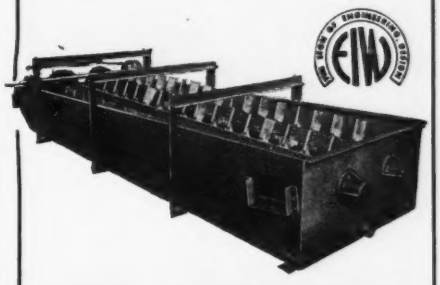
▶ Mr. and Mrs. Don Gustafson are miners in Alaska in the summer, and ranchers in Montana in the winter. They both like both jobs. They have the Hiyu quartz mine at the head of Fairbanks Creek, near Clearly Dome, in the Fairbanks area, and they have mining interests in several other camps in the Tanana Valley. At his main property Mr. Gustafson has a modern mill producing gold and he is now developing antimony showings at that property, where he will work a small crew during the winter.

▶ Leo Saarela, who is in charge of the mercury being received by Metals Reserve Co. at Anchorage, reports that he already is receiving and paying for this much-wanted war metal. The first check went to the owners of a property in the Sleetmute country, on the upper Kuskokwim. The first shipment brought $192 a flask less $4 per flask for transportation and analysis. A fund of $10,000 was set aside last July for the purchase of any antimony, mercury, tungsten, and tin produced in the district. Saarela says mercury can be easily sampled but that it will require a plant to test the three other metals. This it is hoped will be built in the summer of 1943. Such a plant in operation at Fairbanks has already received about 50 tons of antimony and tungsten. Several tons of antimony from the Chulitna area have been sacked and will be sent to Anchorage for testing, and it is said the Anchorage office hopes to purchase about $10,000 worth of mercury by the close of 1943. Alaska's entire yearly production in the past has been about $40,000.

▶ Every gold mine in Alaska is said to have closed down except those mines which have a serial number under order P-56. It is said the only one which so far has this rating is Alaska Juneau.

Eagle Log Washer

FOR WASHING MINERAL ORES



FOR ADEQUATE CLEANING OF

manganese ores
Bauxite
iron ores
phosphates
and other minerals

Tough Clays Removed

• This Log Washer was designed to handle those tougher cleaning jobs and to adequately break down clays or conglomerates.

A longer tub and greater action of the paddles makes it possible to successfully remove the foreign matter. The abrading and cutting action takes place for a longer than ordinary time.

BOTTOM WATER INLETS furnish an upward current of water the full washing length of the tub to raise and float out the foreign material of specific gravity lighter than the aggregate.

PADDLES 36" DIAMETER of our special semi-steel mixture deeply chilled on the wearing surfaces insure the greatest amount of service.

TIMKEN ROLLER BEARINGS operate in housing above the water line where they take all the end thrust of the log shaft. No chance for grit to wash into the bearing and cut it out.

Today, with bigger production jobs required, the washing of mineral ores is an important operation. If you are planning on the installation of new equipment and are interested in making sure of clean concentrates, write us today. Send samples of your material for inspection and test.

Buy Bonds and Buy More Bonds

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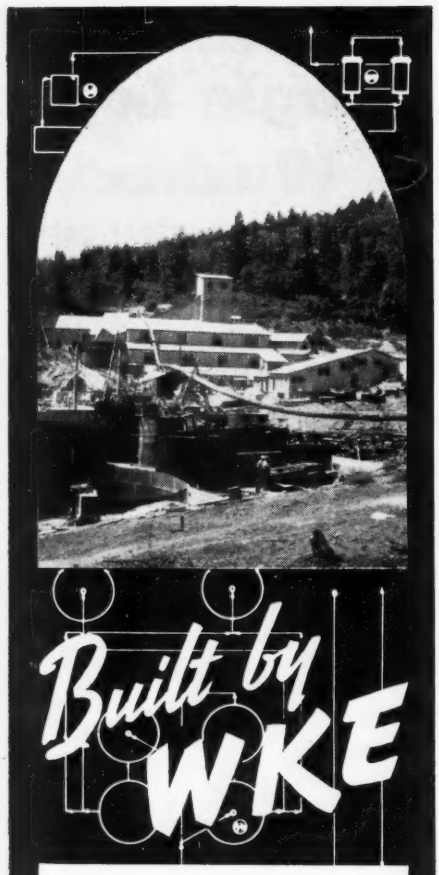
DES MOINES IOWA



Plants for the recovery of values in metallic and non-metallic ores have been designed and built, or modernized, by WKE throughout the West. ● Visiting any one of these plants will furnish you ample proof of the ability and experience of the WKE Engineering staff.

May we send you our new bulletin listing and illustrating a representative group of major plants built by WKE?

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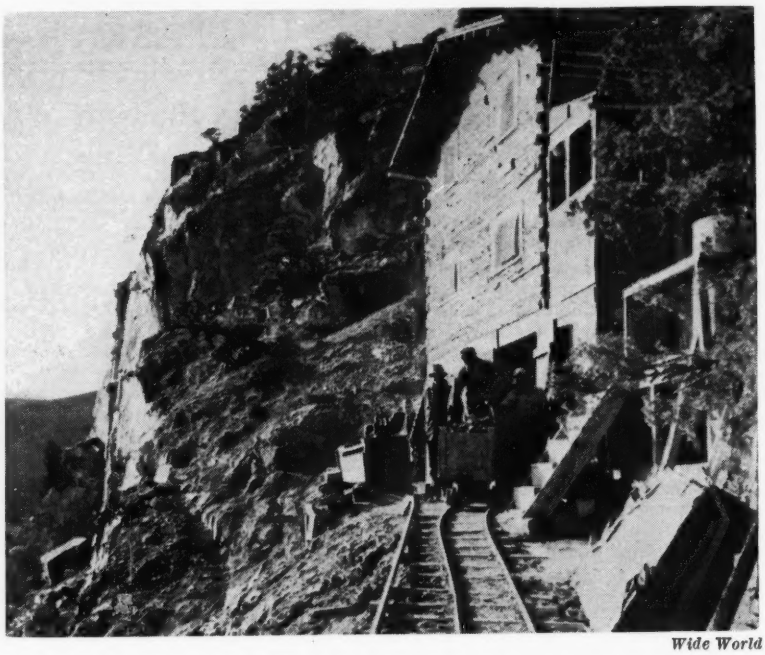

Wide World

Adit of Big Four lead-zinc mine, Kremmling, Colo., and home of owner, "Tex" McDaniels

UTAH

Tax Commission Urges Valuation Change

Mulock elected president of mine operators' association—Preliminary development loan to Bullionville mine—R. E. Phelan to manage Kalunite, Inc.

▶ The Utah Tax Commission will recommend to the State Legislature convening in January that valuation of mines for taxation purposes be computed on two times the three-year average of net proceeds. The law now requires that valuation be based on two times the net proceeds for the twelve-month period preceding the tax year. Amendment of the law, the commission argues, will eliminate the violent fluctuations of receipts from the net-proceeds tax, which is so disturbing to budget making and public finance.

▶ Two Utah silver-lead producers declared dividends during December. The Silver King Coalition Mines Co. paid on Jan. 2, 1943, a dividend of 10c. a share, totaling $122,046.70 and bringing the grand total of disbursements up to $30,127,916.35. On Dec. 24, Tintic Standard paid a dividend of 2½c. This dividend, No. 100, amounts to $28,502.25 and increased the grand total to $18,608,054.78.

On Dec. 15, F. S. Mulock, vice president and general manager of Western operations for the U. S. Smelting, Refining & Mining Co., was elected president of the Utah Metal Mine Operators' Association, succeeding W. J. O'Connor, manager of the Utah department, American Smelting & Refining Co. Other new officers elected were J. O. Elton, manager of the International Smelting & Refining Co., first vice president; Frank A. Wardlaw, Jr., assistant manager of I. S. & R., second vice president; and E. H. Snyder, general manager of the Combined Metals Reduction Co., third vice president. A. G. MacKenzie was re-elected manager.

▶ Two Utah mining organizations have secured loans from the RFC. George H. Ryan and associates were granted a preliminary loan of $5,000 for unwatering of the Cashin copper-silver mine, in Montrose County, Colo. Operations will be carried on under the corporate name of the New Cashin Mines, Inc., Heber City.

▶ Amos Epperson, of Salt Lake City, received a $20,000 loan for the development of a lead-zinc-silver-gold deposit near Bullionville, Tooele County.

▶ Robert E. Phelan, formerly in charge of operations at the Flin Flon properties, in Canada, and until recently manager of Basic Magnesium, Inc., at Las Vegas, Nev., has been appointed general manager of Kalunite, Inc. The announcement was made by F. S. Elfred, Jr., executive of the Olin Corporation, parent of Kalunite, Inc., which is constructing a Defense Plant Corp. plant in Salt Lake, City, to convert Marysvale alunite into alumina, for shipment to a reduction plant at Tacoma, Wash.

▶ Three valuable collections of minerals and geological specimens assembled by the late Clarence N. Gerry, U. S. Bureau of Mines statistician at Salt Lake City, were bequeathed by his will to the University of Utah, the U. S. Bureau of Mines, and Dr. R. E. Marsell, of the university department of geology. In addition, Mr. Gerry left the university a large library of technical publications and professional papers.

COLORADO

Golden Cycle to Handle Base-Metal Ores

Cripple Creek to be reopened for limited production—Revenue tunnel group being rehabilitated—Leadville drainage tunnel still under consideration

▶ Golden Cycle Corporation, armed with a new WPB order permitting it to mill gold and zinc ores, is planning to utilize the stores of strategic metal in the old dumps of Leadville and mines of the Cripple Creek district. The plans for the new operation, which prevent the closing of Golden Cycle's big mill at Colorado Springs, will give all of the small mines within range of the Golden Cycle mill an opportunity to carry on their mining operations throughout the winter. Further, this will permit the smaller operators to have ample funds without having to wait for ninety days for smelter returns. President Shoup of Golden Cycle has entered into a contract whereby the Ore and Chemical Co., operating at Leadville, will provide ample zinc ores to assure operation of the 300-ton flotation mill. This zinc mill was operated between 1929 and 1939 but stopped operations, as the company could not get sufficient complex ore, and because the price of the base metals was so low. A sink-and-float plant, with a capacity of 1,000 ore-tons a day, from the dumps at Leadville, will be completed by May, 1943. This will make a rough concentrate for shipment to Colorado Springs, where selective flotation will separate the zinc and lead. The fines, unsuitable for sink-and-float treatment, will be treated at the California Gulch mill at Leadville. The flotation mill at Colorado Springs will be ready to operate within sixty days. Notices have already been sent to producers of zinc ores that the corporation soon will be able to handle their ores. They will store crude ores until the mill is ready for operation. If sufficient ores are assured, the mill will be enlarged. The new WPB order permits the Golden Cycle mill to handle some gold ores along with the zinc ore, and curtailed gold mining activities at Cripple Creek will be permitted to continue. Meanwhile the machine shops at Cripple Creek will soon be ready for war contracts.

▶ Walter McDaniel, a veteran of the first World War, and who was a penniless prospector, and his wife made a rich gold-silver-lead-zinc strike at Green Mountain dam near Kremmling, after geologists and engineers had failed to give the property more than a passing glance. Their Big Four mine is now producing sphalerite ore averaging more than 50 percent zinc. Milling ore will be shipped to Colorado Springs, where it will be treated in the Golden Cycle plant. Inasmuch as construction work on the Green Mountain dam has been stopped, the Big Four mine will have a couple of years in which to operate.

▶ Valuable tungsten ore has been discovered in the Pollock district, near Breckenridge. A new prospect at Blue

Buell Dust Recovery Systems help put it there

High Explosives are "booming" these days. America's arsenals are turning out astronomical quantities of bombs, shells and torpedoes...every one with a deadlier-than-ever "boom" for our enemies.

Sulphuric acid is important in the manufacture of explosives, but absolute purity of the acid is essential. Buell Dust Recovery Systems are used in conjunction with the contact method of making sulphuric acid because their high efficiency in removing contaminating flue dust from the sulphur dioxide gas assures purity in the finished product.

This is just one of many ways in which versatile Buell Dust Recovery Systems are helping industry achieve its war production goals by preventing contamination and salvaging critical materials for re-use. The van Tongeren "shave-off"—an ingenious design feature found only in Buell cyclones—insures exceptionally high collection efficiency, low operating cost and long life. Buell cyclones have no moving parts and require little or no maintenance or attention.

Buell Dust Recovery Systems easily handle high temperature gases, and can be installed for any desired capacity from 300 c.f.m. up.

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Factual 28 pg. book. Write for Bulletin E-43.

Memo to:

MINING AND METALLURGICAL INDUSTRY

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BUY WAR BONDS AND MAKE THE AXIS BITE THE DUST

THANKS FOR THE TIP...WE'LL USE PALMETTO PACKING

Ask any user why he prefers Palmetto Packing.

He'll say something like this: "I've tried a lot of packings and I find Palmetto lasts longer, stays soft and never scores a shaft."

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SELF-LUBRICATING PACKINGS

▶COLORADO

Lake contains huberite and scheelite ores. A $10,000 RFC loan has been granted. Superintendent Ross Parker of Alma reports that he has ore of equivalent value in sight. Generators, compressors, and trams will be installed, and J. G. Clark, of Boulder, has arranged to purchase the tungsten ore.

▶The Eureka Nest Egg mine, in the White Pine district, northeast of Gunnison, carrying zinc-lead carbonates, is being operated by Callahan Zinc-Lead Co., with L. B. Stitzer as superintendent and D. Ray McDonald as foreman.

▶George E. Collins, Denver mining engineer, is making plans to reopen the Pozo mine, near the Hidden Treasure, California, and Hubert mines in Nevadaville Gulch. An electric power line will be extended to the Pozo mine, to facilitate mining of the zinc orebody.

▶A lease has been secured on the Joe & John, and Henrietta groups of mining claims, located in Prospect Gulch, by Julian Hall, of Denver. A crew of men is opening up the properties and getting them into condition for actual mining operations. These claims were large producers of zinc, lead, and copper ores, and according to Harry J. Newton, associate of Hall, are being financed by RFC.

▶A strike of copper ore on the Notaway vein has been made by Kingmill Mines Inc., at the Pittsburg Notaway mines, near Central City. The vein, practically a grass-root discovery, has been opened for 60 ft. on the 100-ft. level, and averages three to five feet across the drift on face and back. The entire vein is running about 5 percent copper from chalcopyrite and tennantite mineralization enriched by secondary sooty chalcocite, and carries good values in silver and gold. This new discovery can be developed through the 1,000-ft. Notaway shaft. The company has been operating the mines and mill continuously since 1940, and has been shipping concentrates to the A.S.&R. Co. at the rate of several hundred tons per month. A second grinding unit increased the mill capacity to 125 tons per day—yet labor shortage has caused the property to operate at reduced capacity. The size and richness of the new deposit will give added tonnage of copper to production in 1943. Kingdon Gould, of New York, is president, and George W. Danchy is vice president and manager.

▶Some rich discoveries of high grade zinc-lead ores have been made by the Rico Argentine Mining Co. Values in the upper workings east of town are considerably higher than they have been for some time, reaching as high as 20 percent combined zinc-lead values. The Shamrock mine, in the northwest part of town, has had values with combined zinc-lead of 45 percent.

▶From eight to a dozen men are now working on the dump of the old Mollie Gibson mine, at Aspen, for the Herron Brothers. New buildings are being erected, foundations for the heavy equipment have been completed, and the machinery should be erected during the next thirty days. Ore bins were constructed, and the crusher and screen plant recently purchased were installed, in December. Values lost in the earlier processing methods will be reclaimed, and custom work will be solicited.

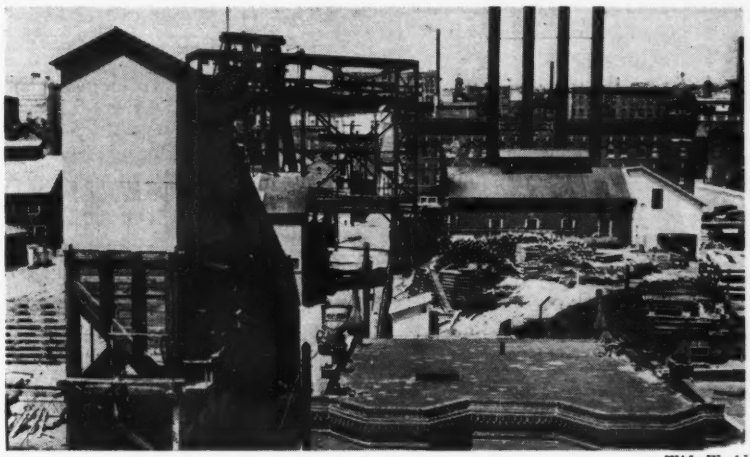
▶The Mendota shaft, in Clear Creek County, has been unwatered below the fourth level, and the tunnel-level drift has been cleaned out and retimbered to carry water coming from adjoining properties and prevent it from going down the shaft. The South Frostberg, intersected by the Victoria tunnel 1,600 ft. from its portal, is being put in condition for production, with an excellent showing in stopes both east and west of the tunnel. The property has recently been taken over by Wallace K. Howard and associates. The mine has been systematically explored and is in excellent condition.

▶The Silver Plume Mines Co. has cleaned out the Diamond tunnel level for a distance of 1,500 ft. and is nearing the bottom of the Guinzi shaft. John A. Smith, manager, has a small crew of men working.

▶The famous group of Clear Creek County mines comprising the Cumberland, the Revenue-Virginius, and the Wheel of Fortune lodes, known as the Revenue tunnel group, former rich producers of zinc, copper, silver, and lead, have been reopened by William L. Cutter and L. K. Requa. Recent assays taken across the Cumberland vein returned 22 to 29 percent lead and over 9 percent zinc. Development work will be carried on as rapidly as possible. The Revenue to date has been developed by a 2,200-ft. shaft, and unwatered by the 8,000-ft. Revenue tunnel. There is also a shaft extending 760 ft. below the original shaft. The lease, secured from the Reynolds-Morse Corp., of Denver, is for a long term with option to purchase. Most of the ore in the past has come from the Virginius and Terrible veins, as the Cumberland and Wheel of Fortune have scarcely been touched. Up to 17 levels have been worked, and there is still a large amount of virgin ground.

▶James H. Isabell has started reopening the Bull-Domingo mine shaft north of Silver Cliff. According to present plans, the old shaft will be retimbered to water level and then unwatered to the 600-ft. level. The large bodies of zinc ore revealed when the Bull-Domingo was a producer were left untouched. A federal loan has been obtained by E. L. Laycock, who states that the work will be pushed as rapidly as possible. Past production shows over $1,000,000 from one ore chimney; the ore carrying zinc, lead, and silver. The mine is developed by a 1,000-ft. shaft with little lateral extension.

▶Engineering studies by several interested government agencies concerning the proposed Leadville drainage tunnel are still being made and nothing will be done concerning the matter until these investigations and discussions are complete. Four tunnel proposals have been made, and numerous calculations on the estimated quantities of water that will be encountered, as well as the final flow of water that will have to be reckoned with.



Wide World

View of the Emma mine, important manganese producer, in the heart of Butte—Note roofs of residences closely adjacent to shaft

WASHINGTON

Northwestern Mining Convention Meets

Bureaucrats hear themselves denounced—Metaline district output curtailed by labor shortage—Howe Sound shipping zinc concentrates

▶ The 48th annual Northwest mining convention, in Spokane, was not a convention at all but a conference of much importance between the mine owners and heads of government agencies. Instead of the usual resolutions, a declaration of policy was adopted after being prepared by the heads of mining associations and representatives of the government. It declared the need for a political policy in a broad sense streamlined to win the war and furthermore that the worker should have a fair wage; it urged greater cooperation of government agencies with each other and with the mining industry, and it opposed "business as usual," "politics as usual," and "unionism as usual," which should be eliminated for the duration of the war. Two resolutions were adopted, one introduced by Donald A. Callahan, of Wallace, declaring in favor of a national service act to provide the necessary man power for the extractive, agricultural, and manufacturing industries engaged in production of war material. The second resolution approved the firm stand taken by those members of Congress who advocate the maintenance of silver as an integral part of the money system and who realize that silver is produced mainly as a byproduct of the war metals.

"We of the West must unite to throw off bureaucratic control and business restraints that are retarding the growth of the western half of the United States," declared Congressman Compton I. White, at a public luncheon. It was also asserted at this luncheon that there are now nine federal bureaus dealing directly with the mining industry, of which six seek essentially the same information from State sources. Dr. Francis A. Thomson, president of the Montana School of Mines, at Butte, urged greater cooperation than now exists between the numerous federal agencies which have to do with the mining industry during the war.

Morton McCartney, of Washington, D. C., formerly of Spokane, now chief of the self-liquidating division of the RFC, reported that six government mining loans have been made for more than $100,000 and that 136 have been granted throughout the nation ranging from $5,000 to $20,000. Bliss Moore, of Spokane, regional technical advisor of the mining branch of the WPB, spoke of the work being done. J. R. Dille, San Francisco, regional supervisor for the U. S. Department of Labor, wages and hours division, declared that the elimination of provisions to pay time and a half for all hours worked over 40 in a work-week would not add one hour to production. Dr. R. S. Dean, assistant director of the U. S. Bureau of Mines, spoke of the work being done to develop aluminum clays in the region. The conference was conducted by Northwest Mining Association, assisted by Columbia Section of the A.I.M.E., the Spokane Chamber of Commerce, and the Mining Association of Montana. Roger O. Oscarson, of Spokane, was convention chairman.

▶ Western Molybdenum Co. has secured a $5,000 government prospecting loan and has started unwatering a vertical shaft and three level openings. C. D. Robinson, Spokane, is receiver. This property was operated years ago for its copper content, but work was abandoned when it encountered what was called "black stuff"—the molybdenum.

▶ According to Ivan Bloch, chief of the market development section of Bonneville Power Administration, eastern Washington and northern Idaho, a region contiguous to Spokane, have many clay deposits which offer distinct possibilities for the production of alumina, using the acid processes. It appears, he said, that technicians of certain companies working in close collaboration with the U. S. Bureau of Mines have arrived at a point where suitable commercial processes have been developed for the utilization of high-alumina clays. It is hoped, he said, that within a few weeks concrete proposals for the establishment of alumina plants, based on

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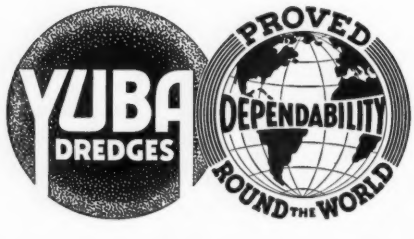

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high-alumina clays, will be presented for the approval of war agencies. He pointed out that suitable deposits must be of considerable size, obtainable at a low cost and unhampered by much overburden. Under these conditions he foresees this region as the light metals nucleus of the nation.

▶ Seven to eight hundred tons of zinc-lead ore is ready for shipment at the Red Top mine, in northern Stevens County, according to J. Richard Brown, of Spokane, managing engineer. Before shipping, as much of the zinc as possible will be removed to avoid penalties at the smelter.

▶ The simple matter of the arrangement of districts is causing the mining companies of the Metaline district great difficulty in securing their share of such laborers as are available, according to D. I. Hayes, manager of the Metaline Mining & Leasing Co. and of the Grandview Mines Co. The Colville district and the Metaline district are contiguous and it is not surprising that they were put in the same district for handling laborers, but the flow of labor in the Metaline district is to and from Spokane and that in the Colville district is also to and from Spokane, instead of to and from each other. As a result, few laborers released in the Colville area get into the Metaline district. Mr. Hayes says his operations are short about 25 men and have been for three months.

▶ Early months of the new year should see the production of magnesium at the new Washington plant, declare men in charge of construction. The magnesium will be produced from dolomite deposits on the Great Northern Railway, near Marble, in northern Stevens County. Approximately 250 men will be employed in the quarry. About 1,000 men are employed in construction of the reduction plant.

▶ Howe Sound Co. has made its first shipment of zinc from its property at Holden, in the Cascade Mountains. It is not expected that this will prove profitable, but the company is doing it as a war measure. The ore is separated by flotation from the copper minerals, which are the principal ore minerals. Zinc is not found in large quantities, and it is said the cost of extraction is about equal to the revenue from it.

▶ Joe Garvey, of Colville, reports that Stevens and Pend Oreille counties, in the northeastern part of the State, are making a survey and inventory of all known mines and mineral locations in the northern part of these two counties. The report will cover location of properties, ownership, types of ore, extent of deposits, production possibilities, and data on transportation. The survey is in charge of Colville Engineering Co.

▶ Knob Hill Mines Co., at Republic, continues to make heavy shipments of its iron sulphide gold ore to the Tacoma smelter, where it is desired as a flux. Officers and the few owners in this company are residents of California. A. O. Stewart is president and Walter Lyman Brown is vice president and manager.

OREGON

Central Mill to Finish Chrome Concentrates

Humphreys to erect beach-sand rougher mill—Troutdale alumina plant now operating—Development loan for property at Burns

▶The Humphreys Gold Corp. pilot plant for extracting chromite from beach sands in Coos County is said to be proving satisfactory. Plans are now being made to erect a master plant of movable type as soon as possible. It probably will be erected north of Bandon, where the bulk of the ore deposits owned and leased by the company are situated. High-grading of the crude concentrate will be done at a central plant being built at another site in the county. This plant will be for the use of all chrome producers. Krome Corp., which has its own separating equipment at its mine, will be the first to use this central plant, which is being constructed by Defense Plant Corp., subsidiary of the RFC. The process to be used was developed at Oregon State College under professors W. E. Gleason and Joseph Schulein.

▶Aluminum Corp. of America is operating the second unit of its plant at Troutdale. The unit was built with funds from the RFC to produce refined alumina.

▶C. W. Riddell, of Harney, has received a preliminary loan for the development of his property, 21 miles north of Burns. It formerly was a gold producer but will produce lead-zinc ores when operations are resumed.

ARKANSAS

New Phos Specifications Hurt Manganese Output

Eagle-Picher smelter seeks lower gas rates—Silica Products plant destroyed by fire—Hurricane zinc carbonate mine rehabilitated

▶The rate-discrimination complaint by the Arkansas Smelting Co., of Van Buren, against the Twin City Pipe Line Co., of Fort Smith, was taken under advisement by the Arkansas Utilities Commission on Dec. 8. Charging that its natural-gas rate was much higher than that of other large industrial plants in the same area (Fort Smith), the company, a subsidiary of the Eagle-Picher Mining & Smelting Co., asked for a reduction below its present rate of 12¢ per thousand and cited a great increase in consumption and a round-the-clock work schedule.

▶After drilling six holes of its program of 18 holes, in the Rush area, in Marion County, the U. S. Bureau of Mines abandoned the program and moved out. The allocated funds were used up after drilling six holes because diamond drills were used, instead of the cheaper and customary churn drilling. This drilling program was to prospect the Cotter formation, which lies several hundred feet below the Everton formation, in which practically all of the mining has been done up to date in the area. The Bureau officials reported that they found no ore in the Cotter formation in the limited amount of drilling done. Outcroppings of the Cotter formation in the north part of the field show ore. Some criticism developed because if the program was wanted to prove up deposits of ore in the Cotter formation, it should have drilled this formation where the ore shows.

▶The Excelsior Mining Co., operating the Excelsior mine near St. Joe, in Searcy County, with headquarters in Harrison, has been reorganized. New drifts have opened up six good operating faces, with two more in sight. The officers of the new company are L. A. Watkins, president; J. C. Shepherd, vice president; Doyle Palmer, vice president in charge of operations, and Pat Williamson, secretary-treasurer. The development work consists of two drifts driven from the main shaft, one, 155 ft. north, the other 64 ft. south. The company has also added one new set of rolls and one concentrating table to its mill equipment, and made other improvements. Concentrate recovery runs around 6 percent of high grade sphalerite.

▶J. C. Shepherd, of Harrison, operating manager of the Hurricane Mining Co., has started operations at the Hurricane mine, near Pindall, in Searcy County. This mine produced zinc carbonate concentrates during the first World War and has been the State's most productive zinc mine. It was a pit mine about 200 ft. long, 80 ft. wide and 40 ft. deep. After operations stopped, a cloudburst in the vicinity filled the big pit with gravel and silt. Shafts will be sunk through this débris down to the old workings in the orebody at the bottom. The Hurricane mine is on the St. Joe fault.

▶The Newton County Mining Co., headed by Pete Wells, of Jasper, Ark., and Charles H. Herman and associates of Chicago, is installing an ore hopper and derrick at its Keys Gap mine, near Jasper. Lack of labor and bad weather have delayed the construction of the company's 100-ton mill at Jasper. It still has one concentrating table to install in the mill, and expects to be in operation within 30 days.

▶In Sharp County, J. F. Lassiter, of Batesville, has opened up a good run of jack on the Penn property, near Eaton. The property consists of 55 acres. Work to date consists of open cuts driven into an ore-bearing ledge about 12 ft. thick. These cuts indicate a face about 80 ft. in width.

▶The Silver Hollow Mining Co., headed by John Dirst and W. J. Cushing, of Yellville, started active operations at the Silver Hollow mine, on Rush Creek, on Dec. 14. Mining heretofore has been with a tunnel, about 1,000 ft. long, which was very crooked. The company expected to sink a shaft to the face and remove production through it. It has changed the program and will straighten out the tunnel, which will be cheaper.

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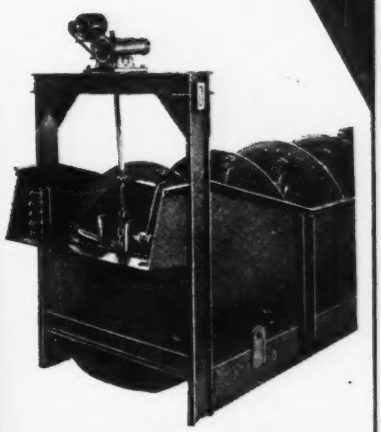

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▶ARKANSAS

Also, it will install a ferry boat in Buffalo River, near the mouth of Rush Creek, and move its crude to the Edith mill, owned by the Maricon Mining Co., for custom milling until it can build its new mill.

▶J. W. Bettis and G. B. Fulk, of Pleasant Grove, are operating on a lease two miles east of Calamine, in the Calamine district in Sharp County. Three shallow shafts and one short tunnel have been driven and sunk into a good body of jack. The work to date, however, has been prospecting and the size of the orebody has not been determined. They have made an application for a development loan from the government and are now awaiting an examination by government engineers.

▶The Moark Mining Co., operating the Red Mill, Almy Jack Pot, and Minnie Lee, in the Zinc area, at Zinc, in Boone County, has its new mill installations completed and in steady operation. C. T. Rabenau, of Zinc, Ark., is in charge. A government loan for operating and developing purposes has been approved.

▶A fire at the plant of the Silica Products Co. at Guion, almost completely destroyed the installation. Damage was estimated at $50,000. The sand processed at this plant is used principally in the manufacture of glass.

▶The ceiling price and specifications recently clamped on manganese ore by the government has greatly hampered production in the Batesville-Cushman field, in some instances lowering the price as much as $10 per ton. This is due largely to the low phosphorus content demanded in the specifications. Furnaces now have to comply with these specifications as well as the buying depot of Metals Reserve. Deductions are made on all ore running over 0.05 in phosphorus. Very little ore produced in this field runs this low in phosphorus, but neither does it run high, and this factor has never hampered production before. Operators in the field are going to demand a Congressional investigation of the situation.

▶E. M. McGary, Stanley K. Bourne, and A. H. Bohn, of St. Louis, have taken over the Enos Linsey Cave property, in the southeast part of Stone County. They have their headquarters in Batesville. The property lies about three miles north of St. James, and operations are being carried on in a big cave. A hoist, a compressor and an air drill have been installed and production was expected to start in December.

▶The Southern Mining & Manganese Co., headed by Berry Fitzgerald and associates of Batesville, is just getting its new concentrating plant, on the Bayou, near Cushman, into operation. It installed sand jigs to clean its fines in November, and they are working out successfully. The company is operating the Southern Hill and Polk Southard mines near Cushman. The finished ore that now comes off the plant is classified as coarse, fine coarse, and fines. It is probably the cleanest and best finished ore ever washed or milled in the field.

Ottawa tailings re-treatment mill of Tri-State Zinc, Inc., Picher, Okla.

TRI-STATE

American Zinc Has New Mine at Aurora

Eagle-Picher proceeding on MRC Paxson operation—Northside company completes mill at Chitwood—Ore Producers Association holds annual meeting

▶Renewed interest in the Tri-State district is being shown by the American Zinc, Lead & Smelting Co., which, in addition to its new development two and one-half miles southeast of Duenweg, has announced plans for exploiting a new orebody drilled out on the Hunter land, a mile southeast of Aurora. A 300-ft. shaft will be put down on the Hunter property, and, as soon as the mine development work is completed the company plans to build a concentration plant, which will have a capacity of 30 tons of ore an hour, according to Ralph E. Calhoun, of Joplin, district representative of the company. A good deposit of blende was disclosed by churn drilling at the mill site by the company over a period of several months, checking previous drilling done in the area by another Tri-State company a number of years ago. Calhoun also reported that the company's recent work on the Henckel-Smith land, two and one-half miles south of Duenweg, is progressing satisfactorily. Three new shafts are being sunk on the two tracts of land, and mining operations are to be carried on around the 170-ft. levels. One of the shafts had been put down to the 90-ft. level, another to a depth of 120 ft., and the third was about 70 ft. deep at the beginning of December.

▶Early in December, the Eagle-Picher Mining & Smelting Co. began the shipment of ore by rail from the mill shaft on the old Velie-Leopard lease, a mile west of Baxter Springs, to the company's Central mill in Oklahoma. The company has reopened a field shaft north of the mill shaft, and is scheduled to ship ore from there soon. As agent for Metals Reserve Co., the company has started a new shaft on the Swalley land, a mile to the west, and, a short distance further west, is reopening another shaft. Ore from these two shafts will go to the Paxson mill, nearby, for treatment. The Paxson property will also be dewatered, reopened, and operated by the company as a MRC project. According to D. C. MacKallor, four millings, or approximately 350 tons, of zinc-lead ores from the company's Nine Acre mine, near Marion, Ky., have been shipped by rail and treated over the Central mill, near Cardin. MacKallor also announced that the company had purchased the San Xavier mine of the New Jersey Zinc Co., 30 miles south of Tucson, Ariz. Expansion work was started immediately at the western mine, and, with the completion of a 250-ton concentration plant, production is expected to get under way within a six-month period.

▶New milling units are being built in conjunction with the No. 4 mine mill of the St. Louis Smelting & Refining Co. for the treatment of old tailings on the property, according to Howard H. Utley, local manager. As soon as the necessary changes are made in milling equipment and circuit, it is planned to continue the treatment of mine ore on the day shift and to re-treat tailings from the lease during the evening and graveyard shifts. Utley also announced that the company had leased the J. M. Bennett mine, in the Waco field, to the Stotts City Mining Co., with Kenneth Childress, of Webb City, in charge of operations. Mine operations at the Bennett mine are being carried on around the 250-ft. level, and the ore is treated over the St. Louis Waco, or No. 9, mill. North of the Ballard property of the company, southwest of Baxter Springs, mine operations have been extended to the Hartley land. An extension on the south side of the Ballard mill is being completed to house equipment for secondary, or fine, crushing. Two 54-in. rolls have been moved from the old primary crushing plant to the new addition. The change in the crushing set-up was made principally to effectuate wet, instead of dry, crushing.

▶The Northside Mining Co. has completed the construction of its 250-ton concentration plant on the old Joplin-St. Louis mining tract, a half-mile northwest of Chitwood. The new plant was scheduled to begin operations the

latter part of December, according to George W. Moore, of Joplin, company president.

▶ The Pearl Mining Co. is sinking a shaft near the old Sunny South mine, in the Thoms station mining area on land subleased from the St. Louis Mining & Milling Co. Among those associated in the development company are Congressman Tom Winter, of Girard, Kan.; Elmer W. Columbia, Parsons attorney, and William M. Frogue, of Columbus, who will be in charge of operations. In the same area, the St. Louis M.&M. Co. has reopened the No. 6 shaft on the old Grasselli No. 2 lease, on which the company operates a custom mill. The Redhorse Mining Co. is reopening the Old Mule mine, a quarter mile southwest of the mill. Sinking of another shaft has been started by the Coble Mining Co. on the Coble land, about a half mile south of the brick schoolhouse in the Thoms Station district.

▶ Other activities in the district during the last month include the following: Carpenter Mining Co. is completing preparations for the reopening of the old Oko and New York properties in the south-central part of Picher, with Fred Carpenter, of Picher, in charge of operations. The C., K. & E. Mining Co. has dewatered the old Consolidated No. 7 mill shaft in the extreme northwest part of the Kansas-Oklahoma field. Associated in the latter company are G. L. Childress and Karl Koelker, both of Joplin, and F. W. Evans, of Picher. Hunt-Craig Mining Co. has resumed operations on the old Craig lease, east of Douthat, after dewatering the lower ground with the installation of two pumps and subsequent pumping for a four-month period. Ore from these three developments will go by rail to the Eagle-Picher Central mill for treatment. Fred Childress, of Joplin, reports that the Childress-Heggem Mining Co.'s old property, a mile southwest of Cardin, is being reopened and will be in production around the first of the new year.

▶ "Mobilizing for Peace" was the subject of an address by Dr. Curtis L. Wilson, dean of the Missouri School of Mines, at Rolla, before more than 100 members and guests at the annual meeting of the Tri-State Zinc & Lead Ore Producers Association held Nov. 30 in Miami, Okla. Preceding the annual banquet, the following officers of the association were reelected: John A. Robinson, of Miami, president; George W. Potter, of Joplin, first vice president; Victor C. Allen, of Joplin, second vice president; L. G. Johnson, of Baxter Springs, treasurer, and James K. Richardson, of Miami, secretary. Two new directors, Floyd W. Gooch and Ralph E. Calhoun, both of Joplin, were named to succeed John J. Inman and Sam Ashe.

▶ An unfortunate complication has developed with reference to the tax status of Tri-State tailings re-treatment operations. In declaring an excess-profit tax exemption on revenues due to Metals Reserve premium payments, Congress certainly did not intend to except tailings re-treatment. However, in seeking to give the clause broad coverage,

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▶TRI-STATE

the exemption was granted to operations eligible to claim depletion deductions, which privilege is not enjoyed by tailings operators who did not mine the ores from which the tailings were made. This is a serious blow to tailings operations, as future production from this source must depend on tailings so low in grade that they are scarcely profitable to run with full enjoyment of premiums.

Eagle-Picher Leases San Xavier Mine

ANNOUNCEMENT has been made that the Eagle-Picher Mining & Smelting Co. has acquired the San Xavier mine from New Jersey Zinc Co. This is a small zinc-lead-silver mine about 30 miles south of Tucson, Ariz., which has been idle for over 20 years, having been operated during the first World War period. It is developed to a depth of 325 ft. Eagle-Picher plans to move its idle 250-ton mill from Ruby, Ariz., to the property, which at present has no surface plant. It is hoped to have the mine in operation by mid-year.

MICHIGAN

C. & H. Purchases Estevant Lands

Progress in sinking "B" shaft—Old Central mine shaft being cleaned out—New body of mass copper at Quincy mine

▶The Estevant lands in Keweenaw County, owned for many years by a French industrial family, have been acquired by the Calumet & Hecla Consolidated Copper Co. The acquisition adds 2,500 acres to Calumet & Hecla holdings. One section is forested by virgin pine, probably the last stand in the Michigan copper country. The lands extend from the south shore of Lake Fanny Hooe to the Montreal River and include Lake Manganese and the old Clark and Manganese mines. Lake Manganese acquired its name from the fact that a seam of manganese ore was discovered near by many years ago. The vein was only slightly prospected and no mining operations of importance were conducted there. Calumet & Hecla probably will investigate the possibilities of the vein, as well as seek copper by diamond drilling. The Estevant lands for many years have attracted attention as the only foreign-controlled property in the district. Edward Estevant acquired the lands in 1858.

▶Albert E. Petermann, president of the Calumet & Hecla Consolidated Copper Co., stated that Calumet & Hecla is "bending every effort to discover and develop new deposits of copper and is determined to banish, for a long time to come, the spectre of Calumet, Ahmeek, Lake Linden, and Hubbell as "ghost towns."

"B" shaft, which was started by Calumet & Hecla early in May in the southwestern part of Keweenaw County, has reached a depth of over 700 ft. after passing through a treacherous hanging wall that required extra timbering for 430 ft. The shaft now is being sunk at the rate of 200 ft. per month and is being completed as it is lowered. Four underground crews are employed and sinking is continuous. The shaft was started as the result of favorable diamond drill cores. As yet the vein is unidentified. Because the drill cores indicated better values at depth, it is planned to sink the shaft to 2,000 ft. on the incline. In the meantime, drifts will be driven from both sides of the shaft to explore the ground laterally. The sinking is under the direct supervision of Capt. Hogarth Penprase and the head timberman is Elmert Maatta. The work of cleaning out an old shaft at the Central mine location in Keweenaw County is progressing favorably and Calumet & Hecla plans to expand the operations as rapidly as conditions warrant. At No. 4, Kearsarge, a new producer, more men have been employed. This shaft is in continuous operation.

▶A big deposit of mass copper has been encountered about a mile below the collar of No. 8 shaft at the Quincy mine and is being removed in sections. Already more than 10 tons have been cut from the mass and there is approximately that much more in sight. The full extent of the mass has not yet been determined. The Quincy is noted for its mass copper. Last year 355 tons of mine mass were taken out, from which was recovered 503,239 lb. of copper. Two of the masses mined last year were on the main lode, south of No. 6 shaft, estimated to weigh approximately 8 tons each. Another mass on the first west lode, No. 8 shaft, was about 18 tons.

Michigan Conference Urges Research Program

SPONSORED by the Michigan College of Mining and Technology, a Mineral Industries Conference held at Houghton on Nov. 21 met to determine specific mineral projects of greatest urgency calling for cooperative mobilization of technical manpower, laboratories, and funds of the various agencies for aiding the war effort. Specifically urged were more magnetic surveys on the Marquette and Menominee iron ranges, and research on beneficiating low-grade iron ores. Intensive investigation of non-metallic minerals were also called for.

The conference went on record as recommending that before loans or expenditures of public money are made for mineral exploration and development, the various governmental agencies involved should consult technical men of disinterested public agencies, such as the federal and state geological surveys, as to the merits of each project.

Proposals advocated for the long-term program were additional topographical, geological, and magnetic mapping of the copper district, State preservation of drill cores, studies of the mineral associations in the native copper deposits of Keweenaw Peninsula, and revision of the standard geological monographs on the Lake Superior district.

IRON COUNTRY

Lake Season Closes With Goal Surpassed

Chandler mine abandoned—Lake Mining Co. to mine Embarrass properties—State leases several Mesabi Range properties

▶ With the departure from Duluth, on Dec. 7, of the steamer "E. W. Pargny," the 1942 shipping season came to a close, so far as the Mesabi Range is concerned. By far the most active season in all history, a total of 69,584,612 gross tons was shipped from this range alone. The Vermilion Range shipped 1,913,214 tons and the Cuyuna Range 2,810,926 tons. The ranges of Michigan and Wisconsin contributed 17,775,783 gross tons to the war effort, giving a total of 92,084,535 tons to be shipped by boat. This represents an increase of about 15 percent over shipments in 1941, the previous high year.

▶ The Chandler mine, at Ely, Minn., has been abandoned and the lease surrendered by the Evergreen Mines Co., of Crosby, Minn. This mine was the second opened in Minnesota, having commenced operations in 1886, soon after the opening of the Soudan mine, at Tower. The Evergreen Co. has dismantled the concentration plant in use at the Chandler and moved it to the Buckeye mine, on the western Mesabi Range. Before becoming exhausted, the Chandler mine had produced from open pit and underground about 12,000,000 tons.

▶ It has recently been announced that the Lake Mining Co., of St. Paul, has been organized as a Minnesota corporation. The special purpose of this new organization was to acquire and develop a group of iron-ore properties on the eastern Mesabi Range. George G. Shallenberger, manager of the Great Northern iron ore properties, is the president of this new corporation. The RFC has made a loan to the company of $3,000,000, and the company will furnish an additional $2,500,000 for developing the orebodies in the Embarrass group of properties near Biwabik, Minn. The properties are estimated to be able to produce 24,000,000 tons of merchantable ore that will require no beneficiation, and it is hoped that a million tons can be made available for 1943. A large drainage problem confronts the operation, however, as Syracuse Lake has to be drained and a canal dug for the diverting the flow of water from lakes north of the main orebody. It is estimated that complete development will require the removal of about 19,000,000 cu.yd. of surface material and rock. Development work and the mining operations will be conducted by Pickands, Mather & Co., with headquarters in Duluth and Hibbing.

▶ The State of Minnesota has announced the results of bidding for iron-ore permits on properties owned by the State. Evergreen Mines Co., of Crosby, Minn., was successful in its bid for the four units comprising the Minnewas mine, near Virginia. This property was for-

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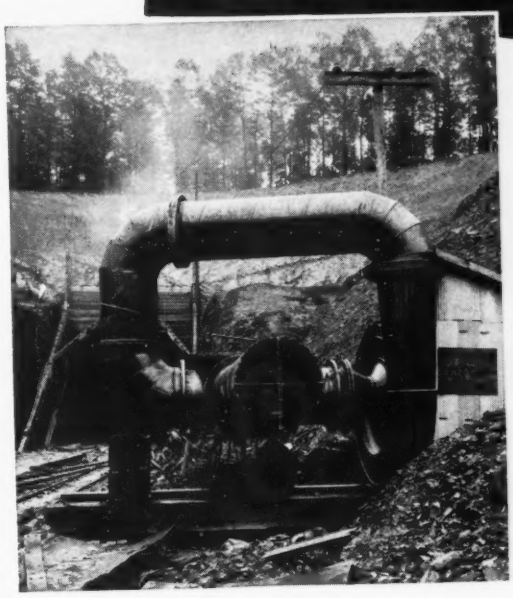

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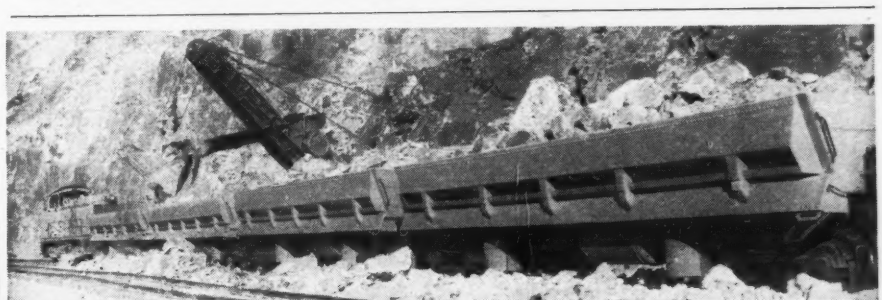

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▶MICHIGAN

merly operated by the Oliver Iron Mining Co. Also granted were leases on three units south of Calumet, Minn., to The Evergreen Mines Co., Butler Bros., and Pickands, Mather & Co. A permit for the Morton mine, near Hibbing, and the Bennett reserve, at Keewatin, was awarded to Kleffman and Haley, of Hibbing. The Inland Steel Co. was granted a lease on an unexplored property near its newly opened Atkins mine, at Kinney, Minn.

▶Butler Bros. Co., St. Paul, Minn., have announced they will begin stripping operations at the Philbin mine, in Hibbing, so that production can start in 1943. R. W. Whitney is general superintendent, with offices at Cooley, Minn.

IDAHO

Gold Order Makes Ghost Towns

Bureau of Mines optimistic over using Idaho clays for aluminum — Highland-Surprise suspends milling operations—New lead-zinc-antimony prospect near Stanley

Nine producing mines of the Coeur d'Alene district this year have paid dividends totaling $5,147,480, compared with $6,085,129 for 1941, and $4,880,614 in 1940. The drop of nearly a million dollars in dividends between this year and last is due to a number of causes, principal among which is increased taxation and an acute labor shortage during the last quarter. The dividend record for this year brings the total paid stockholders of Coeur d'Alene mining stocks during the past 56 years, from 1886 to 1942, inclusive, to a grand total of approximately $183,251,883.

▶At least four flourishing gold camps in Idaho County have been reduced to "ghost towns" because of the government's ban on gold-mining activity and failed to hold elections this year because there was nobody there to vote.

▶Government specialists are looking to the clay deposits of north Idaho as a possible source of aluminum. In the words of S. H. Lorain of Moscow, area director of the U. S. Bureau of Mines, the deposits are "the most promising clays in the Northwest capable of producing aluminum." Preliminary surveys, said Lorain, indicated north Idaho may have the largest deposits in the Northwest, high in alumina, easily mined, and close to reduction plants.

▶The old-time miners around Pioneerville, in the Boise Basin, are not quitting because the government has closed down their gold mines. Two more loads of ore have been shipped by way of the Boise Basin truck line from the Comeback mine, which is being operated by Joe Kordisch. The ore contains strategic metals and will go to Salt Lake smelters.

▶ Lexington Mining Co., of Neihart, Mont., announces the purchase of 850,000 shares of the capital stock of the Callahan Consolidated Mines, Inc., operating the Rex and Patuxent properties, in the Nine Mile section of the Coeur d'Alenes, north of Wallace.

▶ At a meeting of the Eastern-Central Idaho Mining Association, held at Mackay, C. A. Dye, of Salmon, was reelected president, George L. Ambrose, secretary, and O. H. Tschanz, treasurer, and the name of the association was changed to Eastern Idaho Mining Association. The association adopted a resolution approving the action of the Colorado State Mining association on Nov. 15, which urges the War Production Board to authorize the stock-piling of zinc ores in all mining districts and a government buyer to pay mine operators therefor without delay, and also urging increases in zinc prices commensurate with the operating costs.

▶ Highland-Surprise Mining Co., operating in the Pine Creek district of the Coeur d'Alenes, has temporarily suspended milling operations because of inability to secure necessary replacement machinery. When the company ordered new parts it was told that delivery could not be made before next February and no definite promise would be given for that date, so nothing could be done except to suspend milling operations. The company will continue with its mine development, providing it can secure the necessary labor. Exploration of both the Highland and Surprise vein systems has been satisfactory on new lower levels recently opened, and the company has been making satisfactory combination zinc-lead shipments to the Sullivan zinc plant, at Kellogg.

▶ The new slag-fuming plant at the Bunker Hill smelter at Kellogg is expected to be in operation some time in January or February. Construction of the plant has been handicapped by the difficulty experienced in getting necessary supplies and equipment. The plant is being built at company expense and at an estimated cost of about $1,000,000. When operating at capacity it is designed to recover 35 to 50 tons of zinc a day from blast-furnace slag mixed with additional tonnage from old slag dumps.

▶ At the December meeting of the Geological Society of the Coeur d'Alenes, at the Bunker Hill staff house, Kellogg, the guest speaker was Paul H. Knowles, a geologist who accompanied Admiral Byrd's third exploration to the Antarctic regions in 1939. Mr. Knowles gave a graphic description of that memorable exploration, in which he played an important part in mapping 1,000 miles of Weddell Sea coast line and traveling by dog-sled over areas never before visited by man. He made a detailed study of the geology and general characteristics of the southern Palmer Peninsula and has made the first maps and description of that great expanse of ice and snow. His base was 1,500 miles west of Byrd's headquarters at Little America. Rock specimens secured at great effort from a few windswept outcroppings of probable mountain peaks were shown. Slate, diorite, and granite were exhibited in the collection. Some indications of copper and other economic minerals were noted.

▶ The Warrior's Mark, a new lead-zinc-antimony prospect in the Seafoam mining district near Stanley, Idaho, is being developed by Charles LaMarr, of Stanley, who is engaged in driving a 250-ft. crosscut tunnel under a promising mineral outcrop discovered recently, as the name would indicate.

▶ Sunshine Mining Co., of Kellogg, is employing a crew of 40 men at its Crescent manganese mine, on the Olympic Penninsula, near Port Angeles. Between 50 and 60 tons of ore are produced daily, from which the high grade is hand sorted and the remainder stockpiled for future treatment. Other manganese activities of the Sunshine company are at Phillipsburg, Mont., where the company has established an agency for the government for the purpose of buying odd lots of manganese ore.

CALIFORNIA

Several Gold Operations Allowed to Run

Magnachrome producing in Nevada County—Gold Basin mine developing scheelite—Kaiser company interested in scheelite development

▶ Six hydraulic gold mines have been granted permission by W.P.B. to operate after Dec. 8, the effective date of WPB's general shutdown order, for a period of six months, provided they employ only men unsuitable for war work and use no critical materials. Companies or individuals granted the extension include the Red Star mine, in Placer County; J. W. Bergin, Weaverville, Trinity County; W. E. Woodbury, Weaverville, Trinity County; Judge Hydraulic Mine Co. of San Francisco, Pioneer Project Mines, Downieville, Sierra County; and Charles L. Crowder, Orleans, Humboldt County. Short extensions have also been granted to Oro Fino Consolidated Mines at Auburn and Ancho-Erie near Graniteville, both lode mines, and to Golden Feather Dredging Co., operating a large dragline dredge at Oroville, Butte County, to clear river channel to avoid possible flood danger.

Rehabilitation work is under way at the Oak Hill copper mine, near La Grange, Tuolumne County, reopened recently by Oak Hill Mining Co., of San Francisco. The property is opened by a 600-ft. shaft, and eight men are now employed in unwatering operations. Equipment installed includes a diesel-powered hoist, and an air compressor.

▶ Production of manganese has been started by Mangachrome Co. at its property in the Wolf district of southern Nevada County. About 40,000 cu.yd., of overburden have been moved, exposing ore in several places. Mining equipment in operation includes two Caterpillar tractors and bulldozers, and a LeTourneau carryall. A washing plant is available to handle fines. Eight men are employed under the direction of Charles Neville, general manager.

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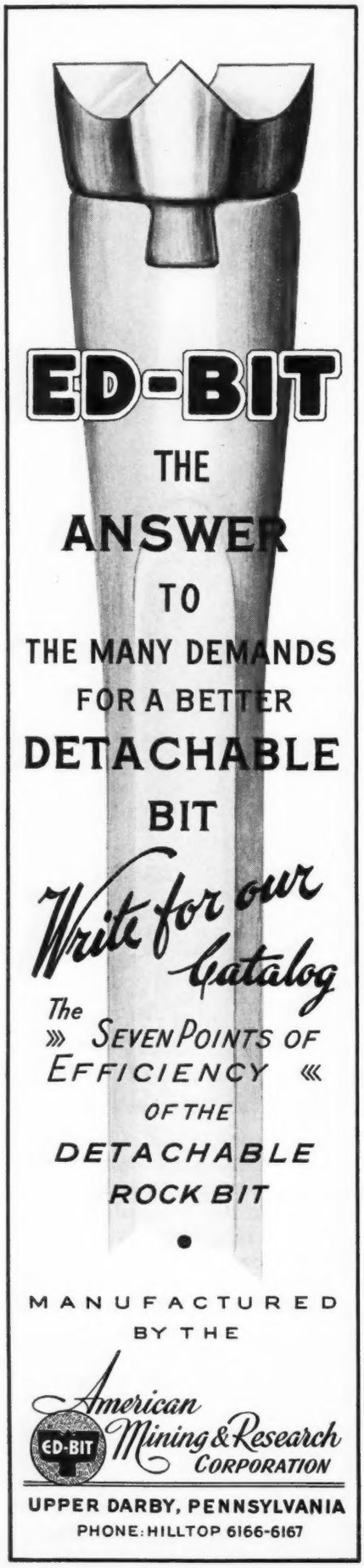

▶CALIFORNIA

▶A scheelite-bearing ore zone is under development at the Gold Basin property, near Randsburg, Kern County, owned by Clarence A. Barker, of Los Angeles, and the available mill is being remodeled to handle output and custom ores. Plans include sinking the shaft to the 300-ft. level and driving drifts on that horizon to facilitate extraction of scheelite ore in sight. J. B. Nosser, superintendent, is in charge of operation.

▶Desert Tungsten, Inc., is installing a 50-yd. tungsten recovery plant on the Walker placer claims at Randsburg, Kern County. The material will be mined and delivered to the plant by a carryall operated by a tractor. William A. Dewitt is manager.

▶The Henry J. Kaiser Co., Iron and Steel division, is reported to have optioned from C. Fletcher a group of ten tungsten claims in the Marietta district near Bishop, Inyo County, with development work already in progress. The holdings are known as the Conscript claims, said to contain commercial tungsten deposits. The company is also interested in the White Rock silica deposits near Mariposa, Mariposa County, from which test shipments have been made to the magnesium plant near Los Altos.

▶Stripping operations are in progress at the Spud Patch placers near Atolia, Kern County, taken over recently by Hoefling Brothers, of Sacramento, owners and operators of the Surcease gold mine, near Oroville, Butte County, now closed. Equipment used includes a 2½-cu.yd. dragline and a Caterpillar D-8 bulldozer, and the washing plant completed and ready for handling scheelite-bearing gravel has a capacity of 50 cu. yd. per hour. The property was a tungsten producer during the first World War. Allan E. Jones is manager for all company mining enterprises.

CANADA

Government Policies Ease Mine-Labor Shortage

Arvida aluminum plant to be world's largest—Canadian Institute holds western meeting — New molybdenite discovery in British Columbia

▶A marked improvement in the labor situation in Canada's mining industry has been apparent since early December, following an announcement by the Minister of Labor, the Hon. Humphrey Mitchell, that adequate employment was being provided for the coal and base-metal operators. Several factors contribute to easing the problem that reached a critical stage in October and November, when gold miners of Kirkland Lake and Timmins were being recruited for the nickel mines of the Sudbury area. The morale of gold miners was shaken by persistent rumors of a general shutdown. As the Ottawa attitude was clarified and ex-miners were encouraged to return to their jobs, and as no further moves were made to shift men from one mine to another, there was a revival of confidence. Absenteeism decreased, women were taken on the payroll in the Sudbury district, and working efficiency has been generally improved. In northwestern Quebec the Provincial colonization program was threatened by a dislocation of mining activity, and the Minister of Mines, the Hon. Edgar Rochette, has announced that a serious study is being made of the problems involved.

ONTARIO

▶After a thorough review of Steep Rock Iron Mines, the Steel Division of the War Production Board at Washington recommended that a loan be made of $5,000,000 to assist in placing the property in production. This property, which lies principally under Steep Rock Lake, is known to contain a considerable reserve of high-grade, hard "lump" ore, which has already proved satisfactory as a finish ore in open-hearth tests on bulk samples. Published ore estimates have varied from 6,000,000 to 51,000,000 tons of proved and probable ore, of which a minimum of 5,000,000 tons are classed as hard lump ore that would be suitable for open-hearth use. Revised plans have provided for initial output in July, 1944, and it is expected that shipments from Port Arthur in 1944 would reach 1,000,000 tons, increasing to 2,000,000 tons a year thereafter. Steep Rock will probably relieve the acute shortage of high-grade ore for use in both open-hearth and blast furnace. All machinery is available in Canada, except certain parts for the motors that will be required in draining Steep Rock Lake and diverting the Seine River. Donald M. Hogarth is president and the Hon. Charles McCrea is vice-president of Steep Rock. As of Oct. 31, the company listed assets at $3,429,258, including $794,549 in deferred charges. The Dominion government has undertaken to spend $3,500,000 on railroad and dock facilities, and the Province of Ontario is to finance construction on 140 miles of transmission line west from Port Arthur to Steep Rock Lake at an estimated cost of $1,600,000. Otis & Co.. is to raise an additional $2,000,000 through the sale of debentures for use in carrying out the program of river diversion, pumping, and mining development, in addition to the proposed loan. Final approval of the loan had not been announced up to Dec. 20.

▶N. H. C. Fraser has been appointed resident manager of operations at the Black Donald graphite mine, near Kaladar, eastern Ontario. The property has been taken over by Ventures Limited, following diamond-drill indications of 40,000 tons of minable material above the 300-ft. horizon. The grinding capacity of the mill is to be upwards of 50 tons daily and production is to be started soon after the old workings have been dewatered. Records show that mine output in the past amounted to about 200 tons of finished graphite a month, which was marketed for foun-

dry and lubricating uses. The present program is in charge of the Frobisher Exploration Co., Ventures subsidiary.

▶ Early in December a diamond drill was flown to the promising scheelite prospect found by a crew working for Dome Mines on the Albany River near Fort Hope in September.

▶ Toburn Gold Mines reports limited encouragement from recent exploration at depth, where values are found dispersed in irregular zones rather than confined to flat-lying veins as on the upper levels. Ore reserves have been diminishing for the past two years, when the ore grade was maintained at better than $18. October production averaged $13.83 a ton. Production for the first ten months was $616,421, compared with $969,347 in the same period a year ago.

▶ Normal gold-silver output is being maintained by Berens River Mines in spite of serious operating problems that are imposed by the isolated location. Controlled by Newmont, the property is on Favourable Lake, up near the Manitoba border and farther north than any other mining operation in the province. Labor shortage led to the employment of Indians, both on surface and underground. It is reported that these natives now represent about half the payroll. Mill equipment is being installed for the recovery of the zinc-lead content of the ore. Development has been carried down to 1,250 ft. and work has been started to open up the 1,400-ft. level. Production is at the rate of about 230 tons a day.

▶ A new oreshoot on the bottom level of Magnet Consolidated Gold Mines was intersected by a crosscut early in December, following its discovery several weeks earlier by exploratory drill holes. The ore occurs at a depth of 1,789 ft. in the west section of the property near the Bankfield boundary and indicates a possible extension upward of more than 350 ft. In the first 36-ft. section to be opened the vein was 20 in. wide and disclosed an average gold content of half an ounce per ton.

QUEBEC

▶ Reference was made to the Arvida plant of the Aluminum Co. of Canada in an address by the Metals Controller, George Bateman, before the annual western meeting of the Canadian Institute of Mining and Metallurgy. Expanded to several times its pre-war capacity, the plant when completed next year will be the largest of its kind in the world, as will also its power source on the Shipshaw River, with an output of a million horsepower. Expanded Arvida operations are to turn out more aluminum metal than the combined world production of 1937, and this one plant is to supply about 40 percent of all aluminum processed in North America.

▶ Quebec has three of the 20 plants throughout Canada now, or soon to be, engaged in concentrating tungsten ores. The Provincial Mine School and Sullivan Consolidated Mines are about four miles west of Val D'Or, and the

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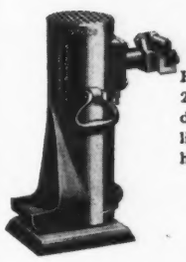

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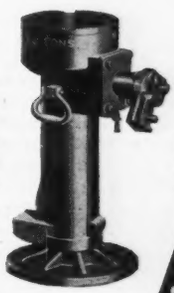

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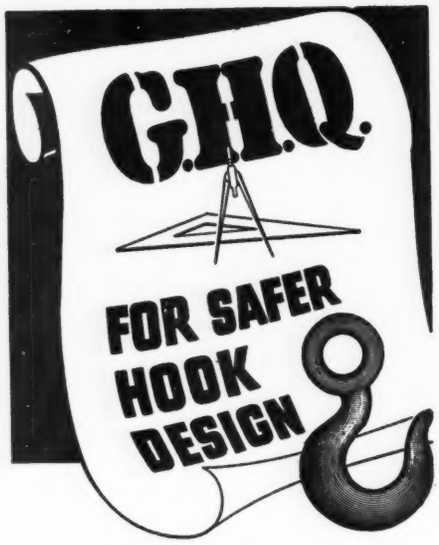

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▶ CANADA

third is in Cadillac Township, at the Thompson Cadillac mill, now under lease to Central Cadillac Gold Mines.

▶-Prospecting activities this summer in the Romaine River area, north of the Gulf of St. Lawrence, have given information that indicates promising possibilities for titanium production. First mapped a year ago for the Quebec Bureau of Mines by Dr. Joseph A. Retty, who reported the occurrence of ilmenite, the area has been worked over this season by prospecting parties. Preliminary sampling has revealed titanium values distributed over large areas that are close to tidewater.

▶ Waite Amulet Mines is reported to have added more than 200,000 tons to the Lower "A" orebody in the course of development work during the past few months, along the outer margins of the main mass. The important "C" zinc orebody has recently been examined, after dewatering the old workings, and may be put into production at a later date. Amulet's reserves were last reported to contain 200,000 tons of copper and 150,000 tons of zinc.

▶ Noranda Mines has made public preliminary details of development work on the new block of levels from 4,475 to 5,475 ft., which are made accessible by the new internal shaft. Cross-cutting is being continued into the main ore section, where the mineralized zone averages about 250 ft. in width for a length of 2,000 ft. Oreshoots of only minor dimensions have been located at this stage of the depth program. Noranda's contract with the National Research Council has been renewed for experimental work on sulphur. With daily shipments of about 500 tons of pyrite, the mine is doing a profitable business in marketing the sulphides that were formerly discarded with mill tailings. Selenium output has also taken on added importance. It is estimated that about half of world requirements for selenium are being supplied by Noranda.

▶ An interim report by L. M. Keachie, president of Powell Rouyn Gold Mines, states that labor conditions at the mine have been improving but were the cause of a 10 percent reduction in tonnage during the quarter ended Sept. 30. The mill was shut down several months ago in order to supply the mine's total output to the Noranda smelter, which also allows a higher priority rating. Recently, the grade of flux ore has increased from $4.04 to $4.40 a ton.

▶ J. N. Norrie, general manager of Perron Gold Mines, Ltd., announces the treatment of 35,035 tons during the third quarter for gold recovery of $427,457. Several promising quartz intersections were recovered in drill cores on the 2,125-ft. level and above, and additional ore was located both in new ground and near old stopes above the 1,000 level. Labor shortage has led to a reduction of development by 20 percent in order to break ore for the mill. Since the first of the year the number of employees has fallen from 317 to 273 men. The mill has been operating at an average rate of 381 tons daily.

▶ To the end of September, Golden Manitou Mines, Ltd., reports production amounting to 15,431 tons and at the end of October the 600-ton concentrator was operating at capacity. Within the next three months mill expansion will make it possible to handle 50 percent more ore than at present, in line with a recently made contract with the Metals Reserve Co. Under the original contract a 55 percent concentrate was called for, and Manitou reports that shipments have so far been well above this minimum grade. Since operations were started in August the underground crew has been adequate to carry out the development program.

▶ The operating profit at Siscoe Gold Mines, Ltd., was higher in the third quarter than in the first, but slightly lower than in the second quarter. Since July, working costs have been lowered from $3.25 to $3.22 a ton in September. A shortage of men has slowed up the development of large areas of low-grade ore that occurs along the walls of the main ore zones. Stoping widths up to 80 ft. have been opened, and this has been a factor in cutting down mining costs. The mill rate of 1,000 tons a day is being maintained.

▶ Sigma Mines, Ltd., declared a 30c. dividend for Jan. 15, similar to the two payments made in 1942 in January and July. Highest production for any month in 1942 was in May, when 34,765 tons were treated, but in both August and October mill feed dropped only 386 tons below that high point.

▶ Production at Lamaque Mines, Ltd., has fallen from 1,200 to 800 tons a day, which appears to be the greatest curtailment of output to be applied at any Quebec mine under present conditions. A large amount of advance development increased ore reserves from 991,309 tons on April 30 to 1,042,897 tons on Aug. 31 and, with this backlog, the mine is prepared to face a period of restricted operations. The development program is concentrating on opening large stopes in low-grade material that averages about $7 a ton across widths up to 80 ft., and diamond drilling is being used in breaking the ore. Although ore has been encountered in shaft sinking to a depth of 3,300 ft., there has been no stoping below the 18th level. Development work has advanced as far as the 24th level, but from this horizon down to the 36th level only limited exploration has been attempted. The mine gives evidence of continuing for many years as one of Canada's major gold producers.

YUKON TERRITORY

▶ November production of The Yukon Consolidated Gold Corp., Ltd., was valued at $174,000, bringing the value of 1942 output to $2,807,000, the greatest in the company's history. This has been accomplished despite a definite shortage of labor, and is the result of careful preparation of ground during the past three years. All dredges have now ceased operation.

BRITISH COLUMBIA

The annual western meeting of the Canadian Institute of Mining and Metallurgy was held in Vancouver Nov. 18 to 20 last and proved a worthy and constructive contribution to the war effort. Without exception the subjects introduced for consideration and discussion were related to furthering the successful prosecution of war. Carefully prepared papers dealing with mining, geology, metallurgy, maintenance of mine and mill machinery and equipment, and the post-war problems of mining engineers provoked valuable informative discussions. Mining progress in western Canada was reviewed by representatives of the mines departments of the governments of Manitoba, Saskatchewan, Alberta, and British Columbia, with several members of the last-named department detailing the policy of encouraging and assisting the search for strategic minerals which has proved so successful. Another noteworthy feature of the meeting was the metallurgical session held jointly with the British Columbia chapter, American Society for Metals, at which a series of timely papers was presented and discussed. The last two sessions were held in the form of symposiums: the first, dealing with strategic and critical minerals, was addressed by George C. Bateman, Canadian Metals Controller, and several members of his staff, members of the British Columbia Department of Mines, and representatives of the British Columbia War Metals Research Board; the second dealt with substitution and salvage, attracting the attendance of master mechanics from the majority of Western mining operations. In view of the steadily increasing shortage of materials required for replacements and repairs, the latter session was of outstanding practical value. More than 260 members and guests signed the register of attendance.

▶ The labor situation in British Columbia gold mines is currently showing an improvement. All gold operations are now permitted to replace key men and are being encouraged to continue production, even if on a reduced scale, and some, notably the Kelowna Exploration Co., Ltd., and Hedley Mascot Gold Mines, Ltd., in the Osoyoos mining division and Bralorne Mines, Ltd., in the Lillooet division, are gradually restoring crews to pre-war numbers on account of the output of byproducts of great value to war industry. Most of the present operators are continuing the payment of dividends, some at the high levels obtaining in recent years. Meymacite (hydrated tungsten trioxide) has been discovered on the Snowshoe plateau, about 30 miles from Barkerville, in the Cariboo mining division. An attempt is being made to outline the boundaries of the deposit.

▶ The discovery of a molybdenite prospect, under option to The Consolidated Mining & Smelting Co., of Canada, Ltd., was discussed at the recent annual western meeting of the C.I.M.M. It is on Boss or Timothy mountain, 45 miles from Lac la Hache, in the Clinton mining division, and has been examined by

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▶BRITISH COLUMBIA

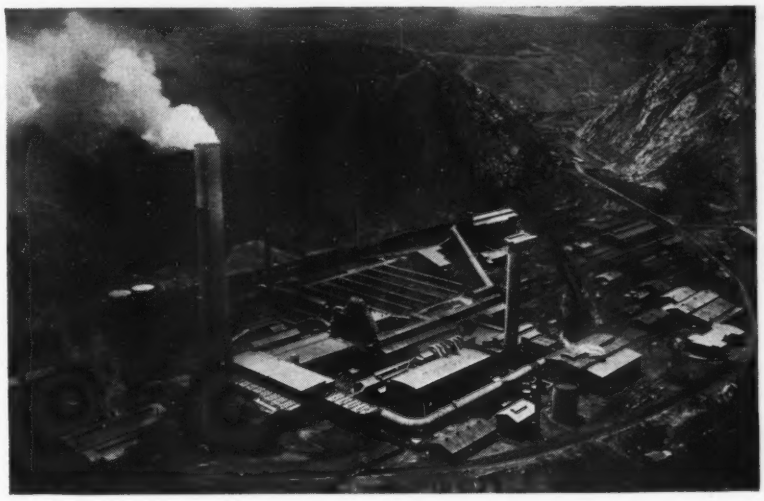
John S. Stevenson, of the B. C. Department of Mines, who reports in part: "The molybdenite is fairly evenly distributed as fine-grained material throughout the unmineralized breccia, a characteristic of the ore which makes it particularly suitable to diamond drilling, as opposed to the erratic distribution of ore in high-grade deposits. The work done to date, consisting of 1,300 ft. of drilling, is not conclusive as to the exact shape or extent of the orebody, but the results are sufficiently encouraging to warrant further drilling and perhaps exploratory underground work." P. B. Freeland, chief engineer of the Department of Mines, states that information to date indicates a deposit of large extent and of commercial value at the present prices for molybdenum.

▶Bralorne Mines, Ltd., British Columbia's banner gold producer, will pay its regular dividend of 20c. per share, plus an extra of 10c. per share on Jan. 15, 1943. On account of the production of tungsten as a byproduct, the company has been granted favorable priority in the hiring of men, and the labor situation at present is adequate to maintain production at close to normal capacity. In addition to the cinnabar property now being developed in the Omineca mining division, the company has undertaken work on another group of cinnabar claims on Relay Creek, within 30 miles of the main Bralorne property, in the Bridge River area. A camp is being established and a tunnel driven. Bralorne is conducting a particularly thorough drive for war minerals, having undertaken the development of a molybdenum prospect near Salmo, in the Nelson mining division, and a tungsten property in the Lardeau division.

▶Pioneer Gold Mines of B. C., Ltd., currently the second largest gold producer in the Province, will omit payment of its customary January dividend. This operation does not enjoy the same priorities on labor as some other gold properties where byproducts of value to the war effort are produced. Operations are currently on a one-shift basis, with the mill treating about 100 tons of ore daily. The company has relinquished its option on the Cariboo property of Snowshoe Gold Mines, Ltd., after a disappointing experience in examination.

▶Kelowna Exploration Co., Ltd., leading Hedley district gold producer, has taken an option on the Sunrise group of scheelite claims, in the Osoyoos mining division.

▶Hedley Mascot Gold Mines, Ltd., milled 17,154 tons of ore in the third quarter of 1942. Net income after provision for taxes, development, and exploration was $54,020, and net earnings per share, before depreciation and depletion, were 2.38c. Average heads were 0.336 oz. gold per ton. Owing to the shortage of labor, the maintenance of normal production required drawing to a large extent on the reserves of broken ore. However, the labor situation is now improving rap-



Smelter of Cerro de Pasco Copper Corp., Oroya, Peru

idly and it is hoped to replenish the reserves as the crew returns to normal strength. During the quarter no exploratory work was done, but diamond drilling resulted in the discovery of more than 5,000 tons of new ore.

▶ Bayonne Consolidated Mines, Ltd., former Nelson district gold producer, has taken an option on and is proceeding with development of the "Blue Eyes" mineral group, a scheelite propect three miles northwest of Rossland in the Trail Creek mining division.

▶ Kootenay Belle Gold Mines, Ltd., has suspended gold-mining operations in the Sheep Creek area and has interested itself in the development of the Whitewater mine, in the Slocan mining division. Kootenay has agreed to subscribe a sum not exceeding $50,000 to pay the indebtedness of Whitewater Mines, Ltd., and to provide working capital for the development program. Should production be undertaken, Kootenay Belle is to receive a return of all advances and 60 percent of the profits. In this event present Whitewater milling capacity of 120 tons daily would be trebled by the addition of the machinery in Kootenay Belle's Sheep Creek mill.

▶ Despite a shortage of 40 in its normal crew of 150 men, Western Exploration Co., Ltd., Slocan Division lead-zinc operator, with head office in Wausau, Wis., is maintaining production at close to normal capacity. The 200-ton mill is re-treating tailings dredged from Slocan lake in addition to treating ore from the Standard and Mammoth mines, at Silverton.

▶ Wartime Metals Corp., Dominion government subsidiary, which also acts on behalf of the Metals Reserve Co., has taken over the operation of the Kootenay Florence lead-zinc mine, on the shore of Kootenay Lake, in the Ainsworth mining division. The concentrating equipment of Ymir Consolidated Gold Mines, Ltd., has been purchased and is being moved to the property. It is expected to provide a capacity of 150 tons daily. The City of Nelson is extending its power line to accommodate the new project.

MEXICO

Mining Beset by Labor Troubles

Miners' union seeks general wage increase —Santa Maria de la Paz handicapped by car shortage—Cia. Minera y Refinadora Mexicana to resume operations

▶ Mining in Mexico was going along generally well with the advent of winter, though it continued to be beset by some handicaps, chiefly labor and transportation.

▶ The National Railways has obtained equipment from the United States, but the pact Washington made to rehabilitate several divisions of that railroad, the greatest in Mexico, has not yet aided mining materially. Cia. Minera de Santa Maria de la Paz, an important San Luis Potosi company, advised the government that it will be obliged to reduce its work or perhaps suspend unless it can obtain sufficient cars to move its ore. The company said that it needs at least 1,500 cars to eliminate ore congestion. Santa Maria is served by the National. The labor ministry is seeking to accommodate the company, in this regard.

▶ Ore stealing continues to bother some companies and the theft of scrap metal has become a problem for the government and the National Railways. The federal Attorney General announced the start of an investigation of the theft of much government-owned scrap iron and other metal from warehouses at the free ports and said several arrests are impending. The railway is out to eliminate pilfering of scrap metal from its warehouses in various parts of the country.

▶ The national Supreme Court rendered a ruling on an odd phase of the mining industry, a decision that establishes a precedent in such cases, when it granted Asarco orders upsetting the conces-

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▶MEXICO

sion the Ministry of National Economy had issued Inocencio Rubio to work dumps of some of its mines in San Luis Potosi. Asarco contended that granting this concession was a violation of its rights, as it should be recognized that the dumps and their contents definitely belong to the interests that produce them. The court accepted that argument and rejected the ministry's plea that inasmuch as these dumps were on federal property it had a right to consider them as being under federal jurisdiction and was therefore free to grant franchises for their exploitation.

▶A.S.&R. is having difficulties with workers of its Charcas, San Luis Potosi, unit, who are staging a series of sit-down strikes as a protest against being photographed for identification purposes. Juan Manuel Elizonda, secretary general of the national miners' union, in announcing these strikes, said that they will be continued until the company relents, and declared that they are justified because A.S.&R. has no legal authorization to photograph its employees.

▶The federal government has assured cooperative miners of the Guanajuato City zone, Guanajuato, financing to the amount of 250,000 pesos ($52,500) to enable them to modernize machinery and equipment. The cooperative expects that as a result of these improvements it will be able so to expand its work that it will be in a position to accommodate 1,200 more members.

▶Mines of the Concepcion del Oro region, Zacatecas, are experiencing difficulty in holding their workers and finding others to replace those who quit because of the lure of higher wages offered by the guayule and fiber industries, which are now enjoying a boom. These mines are also reported to be having trouble because of inadequate transportation services in making shipments to metal-treatment plants.

▶Four hundred prospectors have complained to the Chihuahua government that Potosi Mining has deprived them of a means of livelihood by refusing to let them work on its properties. The State has referred the case to the Labor Ministry, which is trying to settle the conflict. The ministry is also endeavoring to straighten out a mining labor difficulty affecting Cia. Minera de Bolaños, Zacatecas, in the form of appropriation of ore by its miners. The workers admitted to a ministry inspector, sent to investigate the company's complaint, that they have been taking the ore and selling it, because, they contended, they have not received their wages since last March.

▶A permanent exhibition of ore that Coahuila produces is being arranged at Saltillo, the State capital, by Abel Barragan, the federal mining agent, for the prime purpose of being a sort of sample room for prospective investors in Coahuila mining. Barragan reported that representatives of unnamed Texas capitalists are inspecting several Coahuila mining zones with a view to making important investments.

▶Pay has become one of the key problems of the mining industry with a request to President Manuel Avila Camacho by a delegation of the national miners union, headed by Juan Manuel Elizondo, its secretary general, for government aid in obtaining higher wages. The delegation told the President that pay in the industry does not match living costs and as a result, the families of numerous miners are in economic distress. The delegation asserted that mining employers can well afford to increase wages because of higher profits they are gaining from the war demand for their products. The union suspended until some time in December its national convention in Mexico City to rush the delegates back to their sections with orders to calm fears of the miners about the pay situation and induce them to continue working as the government is seeking a solution of their problem.

▶A 10 percent wage increase has been granted by San Francisco Mines of Mexico, Ltd., Hidalgo del Parral, Chihuahua, and has loaned its employees 100,000 pesos ($22,000) to found two consumers' cooperative societies intended to combat high living costs. This loan is repayable at the rate of one peso per week per worker.

▶Early resumption of work, possibly before the end of 1942, has been arranged by Cia. Minera y Refinadora Mexicana, S. A., Pacheco, Zacatecas, which quit some years ago because operations were then unprofitable. The company has arranged with the national miners' union for a working staff and has agreed to pay wages that will be 25 percent over the 1938 scales, provide 2,000 pesos as a gift for the workers to organize a consumers' cooperative society, give 100 pesos a month for the support of this society, and modernize the homes of the workers.

▶By a ruling of the national Supreme Court, Cia. Minera Los Azules, S.A., Los Azules, Chihuahua, was allowed to retain its mining properties, but must turn over its machinery and other equipment to its workers, who recently organized a cooperative. The company appealed from orders of the State Labor authorities that it must surrender all its holdings to the workers. The high court held that machinery and other equipment must go to the workers in part settlement of the large money claim for wages, etc., they have against the company.

▶Enough zinc dust to carry them along for some time has been assured several mines in Guanajuato that were hard hit by a lack of that product, as a result of an arrangement the Mexican government made with Washington. It is understood that this accommodation is of 30,000 lb. of zinc dust, the first consignments of which are to be delivered early in January. Some mining companies are reported to have completed plans for establishing their own zinc-dust plants and will proceed with this work as soon as arrangements are completed for machinery and equipment in the United States.

▶Exports are at a new high, though exact figures on this movement are not yet available.

AFRICA

Witwatersrand Fears Labor Shortage

Libanon development encouraging—Mines cramped by supply shortages—Nchanga Copper and Kavirondo Gold operate at loss

▶ Such of British mining as is not in countries temporarily dominated by the enemies of Britain is beginning to be bothered by a gradually diminishing labor supply. Men are being drawn away by other war activities. The number of natives employed by the South African gold mining companies decreased by 10,827 during October. Northern Rhodesia's government has stopped the recruiting of native labor by the Witwatersrand mines. The number of natives employed by gold mines on the Witwatersrand is now given as 329,321, against 362,497 a year ago. Uneasiness is felt that the number may continue to shrink.

▶ Transvaal gold output in October was 1,165,964 oz. This was only 5,423 oz. more than in September, despite October having one more day. It was 69,820 oz. below the high record attained in October, 1941, but a part of this decrease is due to the treatment of more of the low-grade ore.

▶ Presiding at the annual meeting of Libanon Gold Mining Co., held at Johannesburg, Carleton Jones revealed the fact that for some time before it was decided to suspend operations for the duration of the war development results in the mine had been showing decided improvement. Values were increasing in the northern workings, and south of the shaft another pay shoot was indicated by a continuous stretch of 790 ft. averaging 6.4 dwt. over a width of 54.1 in. He said the 289,000 tons of developed ore was considered sufficient to justify the erection of a plant, and that within about two years after the resumption of operations the production stage should be reached. Evidently in anticipation of the possible early ending of the war, pumping operations will be continued until next June, when the position will be reviewed.

▶ Dr. Hans Pirow explained at the meeting of Blyvoor Gold Mining Co., at Johannesburg, that the area so far developed extends roughly 2,500 ft. north and south on the dip of the reef and 3,000 ft. east and west on the strike of the reef. Adding enough of the wall rock to cover the necessary stoping width to the very rich but narrow leader, a tonnage of 583,000 averaging 14.8 dwt. is calculated to have been developed. It is claimed that the advance made during the initial year of development on the reef is unprecedented in deep mining either in South Africa or elsewhere. Pumping arrangements are only now approaching completion, so it has been found necessary to diamond drill in advance to guard against possible water channels. Such channels have so far been dealt with successfully by cementation, and such water as has

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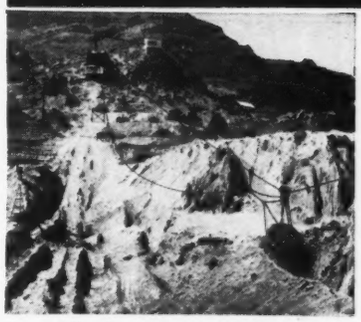

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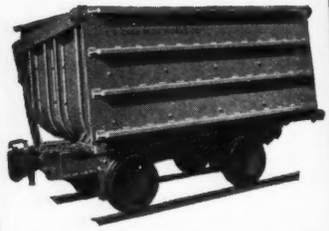

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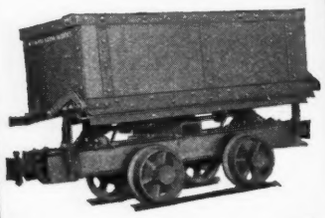

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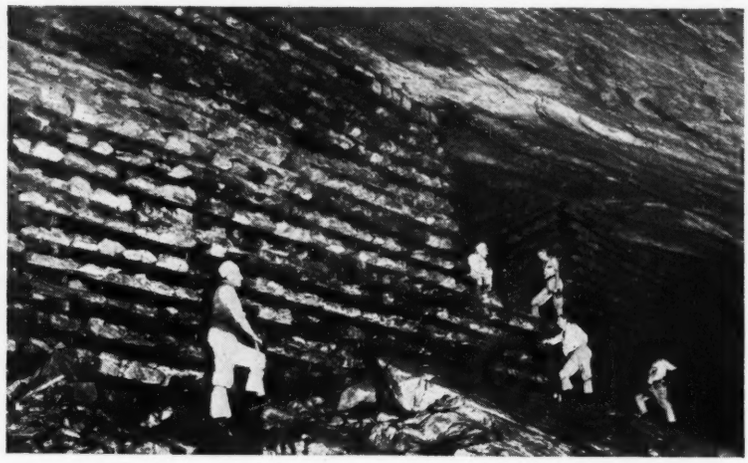

Laced stull, with return airway, supporting wide stope in Rose Deep mine, Witwatersrand

▶AFRICA

been met with has been bailed to the surface. Ore milled so far has come from development ends and, containing much barren fines, has averaged only 7.141 dwt. per ton. Despite this, net earnings have been averaging £6,000 per month. Stoping operations will greatly increase the yield and reduce operating costs per ton.

▶Libanon and Blyvoor are both deferring the sinking of their needed second shafts till after the war. For the same reason, the inadequacy of supplies, development work is being curtailed throughout the district. It is said that in August only about 5,000 tons of mining supplies arrived in South Africa from Britain, but in September the arrivals rose to 30,000 tons. Insufficient shipping accounts for both diminished and irregularity of the supply flow. The outlook is beginning to brighten now and supplies are expected to come forward faster. When the Mediterranean is opened to shipping the available shipping tonnage will be greatly increased. Until then every effort will be made to maintain the average of supply shipments at 15,000 tons a month. This average would enable the producers to keep going at near full capacity, which is their chief ambition. Output buys foreign exchange to assist the war effort, and profits swell the amounts of their war-tax payments. Direct and indirect taxes are now absorbing over 68 percent of the real profits of the Witwatersrand mines, according to a statement by G. H. Beatty at the Johannesburg meeting. It is estimated that 1942 profits before taxation will be under £44,000,000, against £45,845,000 last year, and out of this shareholders may have left, after paying income taxes on their dividends, between £15,000,000 and £18,000,000.

▶Mufulira Copper Mines has declared a dividend of 2s. 3d. per share. This is the same as was paid two years ago. No payment was made last year. Mufulira is neither owned nor operated by the government, but the government gets its production for about two-thirds of the going market price and over two-thirds of its profit in war taxes. The small dividend it is able to pay goes to its owners, which are Rhodesian Selection Trust, Rhokana Corp., and British South Africa Co.

▶After the lapse of two years, Rhodesian Selection Trust has resumed dividends by the payment of 12½ percent (7½d.) on its 5s shares. It depends for its income on its holdings of 64.07 percent of Mufulira's issued capital. The great possibilities of Mufulira after the end of the war makes a readjustment of taxation possible and affords Rhodesian Selection Trust's holdings immense potential value.

▶Roan Antelope has declared a final dividend of 5 percent (3d. per 5s. share) making 10 percent for the year, the same as last year.

▶Rhokana Corp. has declared a first and final dividend of 15 percent for the year to June 30. Last year it paid the same amount final and an interim of 15 percent making 30 percent for the year. As it received a dividend on its 30 percent holdings of Mufulira this year, an increased payment was expected; but the Mufulira payment did not come till after the end of Rhokana's financial year.

▶Nchanga Consolidated Copper mines reports an operating deficit of £38,964 for the year to March 31, against a profit of £17,943 last year. A claim for reimbursement of increased production costs is being made to the Ministry of Supply.

▶Kavirondo Gold Mines, one of the last of the more promising operations in the Kakamega district of Kenya Colony, has finally abandoned three of its small mining undertakings and reports that it is still making small monthly profits from its Chausu No. 2. There was an over-all loss from operations for the year to June 30. Sales of lumber from its timber concession and the use of its workshops on outside orders will, it is hoped, pay current expenses. A decision as to future policy will soon be made.

AUSTRALIA

May Reopen Wallaroo and Moonta Copper Mines

Sons of Gwalia carries on to good effect—Progress made on potash extraction from clay—King Island Scheelite may expand output

▶ Sons of Gwalia, Ltd., the big mine of the Leonora district, situated 150 miles north of Kalgoorlie, had a reasonably successful year in the period which ended Dec. 31, 1941, the report for which has recently been issued. The mine is one of the deepest in the State, having reached a depth of 5,000 ft. on the underlay, equivalent to 3,400 ft. vertical. According to latest advices there is nothing in geological evidence suggestive of any change in conditions or an alteration in the character of the lode and its gold content. As the main shoot of ore is pitching away south from the main underlay shaft to an extent that imposes a considerable increase in barren driving and transport distance, an internal underlay shaft has been sunk from No. 30 level to facilitate future working, and from this shaft and two winzes, No. 31 level is being opened up. Development work for the year disclosed a rather lower tonnage of ore reserves than in the previous year, the grade being 6.04 dwt. gold per ton, compared with 6.17 dwt. In the upper levels, work was mainly connected with reopening the South Gwalia orebodies in depth, and progress has been satisfactory; on the main lode at No. 30 level, operations have added considerably to ore reserves. In the deeper ground attention has been centered on future work from the internal shaft. The tonnage of ore treated during the year was 4,282 tons less than in the preceding year; a total of 150,490 tons was milled, the grade being 6.05 dwt. per ton, compared with the previous year's average of 6.23 dwt. Gold recovered was 42,520 oz. Owing to the steadily increasing manpower difficulties, the tonnage of ore mined has been reduced from 11,000 tons to 8,000 tons per month and further reduction may become necessary. Notwithstanding growing adverse conditions, costs for the year were satisfactory, being 22s. 9.4d. per ton, in British currency, which compare with costs of 22s. 6.5d per ton in 1940.

▶ Good progress is being made with the erection of plant and other preparatory work in connection with the production of potash from the alunite clay at Lake Campion, in the outer agricultural country to the northeast of Perth. Boring in this lake deposit has disclosed 16,000,000 tons of high-grade alunite clay, containing 1,750,000 tons of potash, 3,250,000 tons of alumina, and 750,000 tons of sulphur. Research into the recovery of byproducts shows that these may be of even greater importance than the main objective, potash. It is anticipated that production at the rate of 5,000 tons of potash per annum may possibly become assured by the end of the year.

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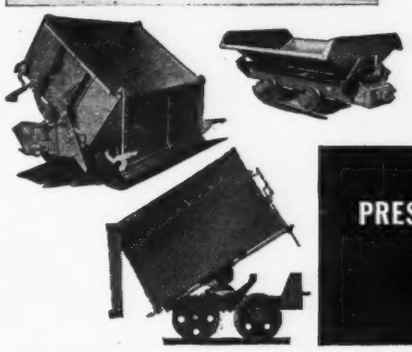

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They're ruggedly-built and—correctly engineered for war-time mining service. Our bulletins giving the details on these high capacity haulage cars should be in your files for ready reference.

PRESSED STEEL CAR COMPANY, INC.
(INDUSTRIAL DIVISION)
PITTSBURGH, PA.

Peak Production Tonnage Aid

CATALOG 2502

It is a handbook of equipment which gives protection from needless outages and slow-downs in electrical operation of mechanized mines.

•

I-T-E Catalog No. 2502 is a complete description of d-c circuit breakers, switchgear and protective relays for mining applications. Its completeness recommends it particularly to those who are engaged in or contemplating mechanized mining.

Our plant, busy as it is with direct war effort in the building of switchgear, has capacity for prompt action in meeting the demands of the vital mining industry.

Representatives in Principal Mining Areas

I-T-E CIRCUIT BREAKER CO.
PHILADELPHIA, PA.

ROSS FEEDER

Completely Controls

the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.

High in efficiency. Low in maintenance and power consumption.

Furnished in sizes to suit your operation. Scalping unit to fit your chute if desired. Send full particulars for recommendation.

ROSS SCREEN & FEEDER CO.

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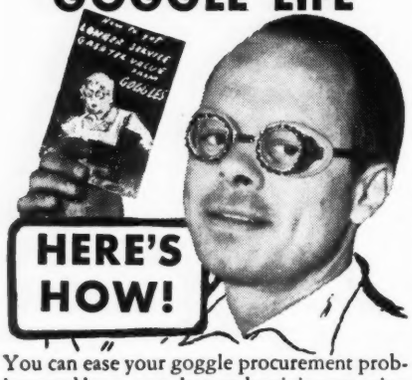
CARE LENGTHENS GOGGLE LIFE



You can ease your goggle procurement problems and lower goggle costs by giving attention to a few, easy-to-use items for maintenance. As headquarters for "Everything in Safety," Bullard offers these ideas in an illustrated booklet, "How to get Longer Service and Greater Value from Goggles." Free. Send for your copy!

E. D. BULLARD COMPANY

275 Eighth Street
San Francisco, California.

Everything BULLARD in Safety

Please send me illustrated booklet, "How to get Longer Service and Greater Value from Goggles."

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NATIONWIDE SALES AND STOCKS

SOUTH AUSTRALIA

▶With the object of increasing the production of copper, investigation has been made into the possibility of reopening part at least of the famous Wallaroo and Moonta copper field, which for more than 60 years was one of the leading copper-mining centers in Australia. The report recently made is not favorable. It is recognized that there are probably undiscovered bodies of copper-bearing ore in the locality and unworked deposits of ore in and adjacent to the existing workings. The former might be located by geophysical work, but inhibiting factors are the presence of salt water at shallow depths and the existence, just below surface, of an extensive bed of clay which effectively masks, or rather simulates, the reactions associated with the sulphide orebodies. With regard to the existing mine workings, it is stated that the known reserves of payable ore are scattered, the lodes extending over a considerable distance, and that it is not possible to work satisfactorily any group of shoots from a central shaft. Individual shafts are too small or in such bad condition that their reconditioning, equated against the tonnage of ore to be mined from them, is impracticable, and in other instances, the quantity of water to be pumped from long lines of connected workings is prohibitive. Diamond drilling for new oreshoots is practicable, the adverse factor being that though the shoots have great vertical extension, their width is short, so that close drilling would be necessary for their location and for the determination of their longitudinal dimension.

TASMANIA

▶The mine of King Island Scheelite, N.L., on King Island, in Bass Strait, is the principal producer of tungsten in the Commonwealth, the average rate of output being 5 tons of concentrate per week. Possibility of increased output has been investigated and the company carried out an extensive drilling campaign during the past year. In conjunction with the controller of mineral production it has been decided that a confirmatory drilling campaign will be undertaken, the cost being shared by the Federal government. Work is to start immediately, employing two diamond drills operating on two shifts per day. If sufficient tonnage of ore of satisfactory grade is established, the directors will equip the mine with the necessary plant extensions and facilities for the greater output. The mine is worked by open cut, using mechanical methods of loading, an average of 700 tons of ore per week being sent to the mill, in addition to which overburden has to be removed. The ore is concentrated by gravity methods, but recent investigations have been made into the addition of flotation to the treatment plant. Tests have also been made into the application of ultra-violet light in the prospecting and mapping of the scheelite occurrences.

New Zealand Mineral Output Expanding

MINERAL PRODUCTION in New Zealand was well maintained in 1941, the report for the year being recently issued. The output of gold and silver has been withheld, so that comparison of these metals with production in previous years is not possible. Several new minerals appear on the list. Bentonite is being mined in increasing quantity, being used principally in the regeneration of moulding sands. Deposits are important but rather difficult of access. Serpentine is being produced in some quantity and there appears to be a definite possibility of establishing an industry on a moderately large scale, provided the demand continues, for large deposits exist and are adapted for cheap mining. The use for the material is for admixture in a finely divided state with superphosphate to produce a special type of fertilizer, which is said to be giving satisfactory results. Asbestos has appeared among the list of mineral products, and commercial deposits are being opened up at which a treatment plant and power plant have been erected. There is a large tonnage available in the locality and the quantity and grade of fiber is high. Antimony shows increased production. The deposits are mostly small and erratic and the occurrences containing ore which can be handpicked have mostly been exhausted. Low-grade occurrences which require concentration are being investigated. Mining of quicksilver is becoming increasingly important, for, though the quantity produced in the year under review is not large, there has been marked increase recently. Production of metallic and non-metallic minerals, other than gold and silver, for 1941 are tabulated below.

	Tons Quantity,	£ Value,
Iron ore	1,544	3,894
Stone	.....	528,313
Pumice	3,160	11,226
Coal	2,639,507	2,639,507
Tungsten ore	67	13,463
Manganese ore	752	2,995
Silica sand	2,034	2,756
Fuller's earth	109	382
Diatomaceous earth	124	503
Serpentine	7,861	6,780
Antimony	17	249
Bentonite	136	578
Quicksilver	2½	5,043
Asbestos	53	240
Clays	1,272	1,273
Dolomite	2,672	1,336

Axis Hurt by Loss of African Minerals

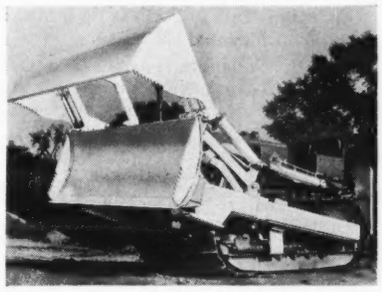
THE INVASION OF NORTH AFRICA by American and British armed forces has deprived the Axis of mineral supplies which have been of some importance to their war effort.

North Africa's principal mineral production has been phosphates and high-grade iron ore. Other products include cobalt ore, manganese ore, pyrites, zinc and lead ore and concentrates, and pig lead. Arrangements have been made by the Combined Raw Materials Board to purchase this output in behalf of the United Nations, the United States to receive the manganese and cobalt ores, and Great Britain to receive the phosphates, iron ore, pyrites, zinc and lead.

Equipment News

New Type Tractor Shovel

AN ALL-'ROUND UTILITY MACHINE which is said to handle most shovel, bulldozer, or scraper jobs is the Drott Bull-Clam Shovel, offered by Hi-Way Service Corp., Milwaukee, Wis. Hydraulically controlled from the driver's seat, it digs, carries, or floats material, dumps it smoothly and evenly-spread.



Depth of the cut is regulated by raising and lowering the clam as the tractor is moved forward. Either end of the clam may be tilted to a 24-in. angle while the tractor is in motion. By keeping the clam wide open, the unit may be used as an ordinary bulldozer without obstructing the driver's view.

Available in various sizes, the Bull-Clams are made to fit all makes and models of tractors and have a heaped capacity range of 1 to 4 cu.yd. Lifting capacities range from 3,000 to 12,000 lb. Total lift is 3 ft. above ground level and maximum drop below ground is 1 ft.

A new Easton double-bodied semi-trailer which was built for moving rock to a crushing plant which did not have a hopper big enough to accommodate the entire 17-ton load at once. This special adaptation of standard equipment was manufactured by Easton Car & Construction Co., Easton, Pa.

Aluminum Paint Substitute

TWO NEW PRODUCTS of Rust-Oleum Paint Corp., Evanston, Ill., are said to provide satisfactory alternatives for the no longer available aluminum paint. Each of these new paints supplies a surface closely simulating the familiar aluminum appearance, but each has a special field of application. The first (No. 18328) is manufactured strictly for outdoor and some indoor uses on metal, concrete, brick, and wood. It provides a high gloss and is chiefly suitable for locations where only minor fume conditions exist.

Higher resistance to corrosive fumes is provided by the second paint (No. 906) which is used in heavy industrial districts, or wherever smoke, brine, dampness, or other adverse conditions are met. The company provides a special consulting service to furnish assistance in the best application of these products.

Wood Lockers

PLYWOOD OR PRESSED WOOD is used to construct the new line of clothes lockers and shelving recently announced by Ivel Corp., New York, N. Y. Because steel for this relatively unessential purpose was no longer available, the company designed lockers of wood which are said to be as satisfactory as the steel lockers they replace.

Designed originally for the Navy Department, the lockers are easily erected, require the use of no hardware, and are light in weight. Ivel Corp. also manufactures wooden shelving in a wide range of sizes and arrangement combinations. No hardware is used in erecting the shelves, an operation which can be accomplished by unskilled labor. Full details will be furnished on request to the company.

Wax-Fortified Paints

BY IMPREGNATING FINE PAINTS and enamels with wax, S. C. Johnson & Son, Inc., Racine, Wis., has secured a product which is said to possess superior qualities of toughness, resistance to wear, and ease of cleaning. Use of wax to form a protective coating on painted surfaces has long been customary, but by use of the new wax-fortified paints, it will be possible to secure the benefits of wax coatings for surfaces otherwise impossible to protect in that way.

Applied by brush or spray-gun, the new paints have a coverage of from 400 to 600 sq.ft. per gal. and can be applied to any wood, brick, metal, or plaster surface. Better lighting conditions are said to result in plants using these paints for interior finishes because the paint retains a bright smooth surface longer than is ordinarily the case and is easier to keep clean. The frequency of re-painting is also said to be lessened. More complete information will be furnished by the company or its agents.

Protective Skin Cream

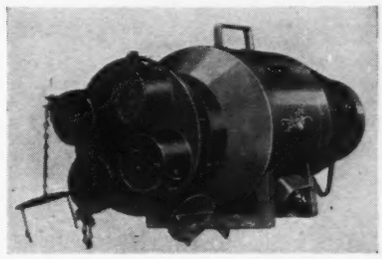
CAUSE AND PREVENTION of industrial dermatitis has been studied intensively in the laboratories of Mine Safety Appliance Co., Pittsburgh, Pa., and, as a result of this work, a new protective skin cream, called Fend, has been developed. Six different types of Fend are now available to afford protection against a number of specific skin hazards, and each is said to embody the most desirable features in its particular field of usefulness.

The creams have no ill effect on the skin, they are easily applied, and are as easily removed by soap and warm water. More details on the specific irritants against which Fend affords protection will be found in a 16-page booklet, Bulletin FA-79, available on request to the company.

Demonstrating use of the new Rubber Lung, a device for administering artificial respiration, recently introduced by E. D. Bullard Co., San Francisco, Calif. Automatically providing natural breathing stimulus, the machine may be used by inexperienced persons, and is said to be superior in this respect to other mechanical respirators or to manual methods.

Portable Exhauster or Blower

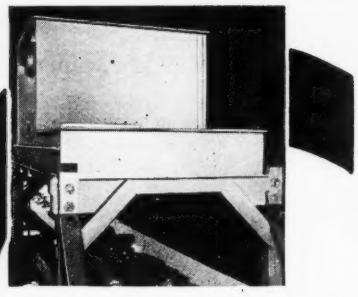
ELIMINATION OF FUMES from any confined space not regularly supplied with adequate ventilation can be secured through use of a 70-lb. portable ex-



hauster or blower recently announced by Chelsea Fan & Blower Co., Inc., Irvington, N. J. Known as the Octopus Jr., the new unit has adapters for 3 4-in. or 4 3-in. nozzles for flexible hose, and caps are provided to close those nozzles not in use.

The machine is powered by a ¾ hp. motor and can suck or blow a maximum

MERRICK WEIGHTOMETER



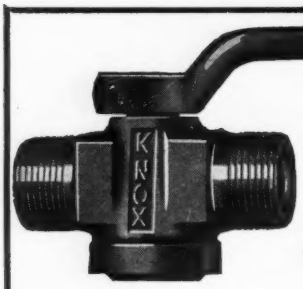
AUTOMATIC WEIGHING WITHOUT PAUSE IN CONVEYING!

The Merrick Weightometer provides a continuous, automatic accurate weight record while material is in motion on conveyor. It weighs without interrupting conveyor service.

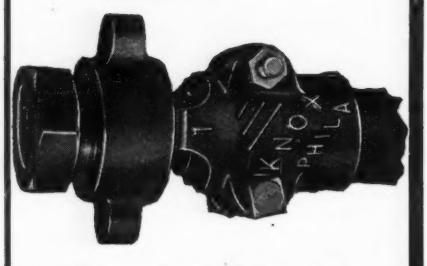
Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

Write for Bulletin 375

MERRICK SCALE MFG. CO.
PASSAIC, NEW JERSEY, U.S.A.



Male or Female Threads

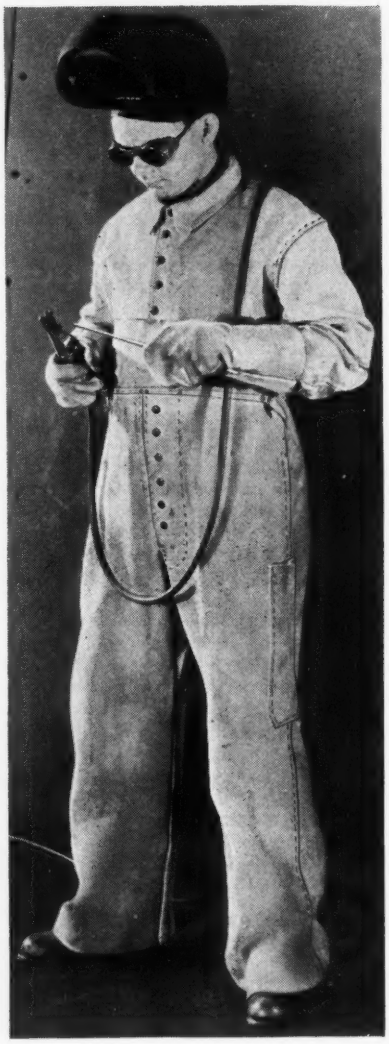


Recognized Universally as the ULTIMATE in Valves and Couplings

KNOX MANUFACTURING CO.
812 CHERRY ST., PHILA., PA.
Since 1911 Producers of

KNOX
Valves-Couplings-Nipples-Clamps-Menders

of 2,000 c.f.m. of air. Easily portable, the unit occupies little space and can, for example, be hung into a small manhole.



American Optical Co., Southbridge, Mass., has developed a new line of welders' safety clothing, as illustrated above. Scientifically designed to afford maximum protection with minimum of inconvenience, these garments are made in a wide variety of styles and sizes. A descriptive catalog will be mailed on request

INDUSTRIAL NOTES

Army-Navy "E" awards for excellence in the production of war materials have recently been given to the following plants: **H. M. Harper Co.**, Chicago, Ill., makers of non-ferrous and stainless alloy metal fastenings; **American Optical Co.**, Southbridge, Mass.; **Barrett & Hilp**, general contractors, San Francisco, Calif.; **Edwards Co.**, a division of **Rogers Diesel & Aircraft Corp.**, New York, N. Y.; and **Macwhyte Co.**, Kenosha, Wis., makers of wire rope, cable, and tie rods.

Phosphate Recovery Corp., New York, N. Y., announces the removal of its Florida research laboratory from Mulberry to 320 Main St., Lakeland, Fla., where it will be under the continued direction of Dr. Allen T. Cole.

Harry G. Smith has been named operations manager of the aircraft parts division of **Reynolds Metal Co.**, with headquarters in Louisville, Ky.

At a recent meeting of the directors of **Marion Steam Shovel Co.**, Marion, Ohio, **John P. Courtright** was named vice president in charge of sales.

William C. Carter has been elected president of Link-Belt Co., Chicago, Ill., to succeed **Alfred Kauffmann**, who has resigned because of ill health. Both Mr. Carter and Mr. Kauffman began work with Link-Belt over 40 years ago as draftsmen.

David S. Youngholm, vice president of Westinghouse Electric & Mfg. Co. in charge of the lamp division, died recently as the result of a heart attack.

A. R. Abelt was recently elected to membership of the board of directors of Chain Belt Co., to replace F. J. Weschler, who died last month.

E. O. Callender has been appointed sales representative for General Electric wiring materials in Ohio, with headquarters in Cleveland.

James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, has announced its first award program in the field of undergraduate engineering study. Its object is "to encourage engineering students to study arc welded construction so that their imagination, ability, and vision may be given opportunity to extend knowledge of this method, and thus aid the war effort and the economic reconstruction in the peace which is to follow." The program offers $5,000 in student awards and $1,750 in scholarships for the departments of the institutions in which the award winners are registered. Awards will be made for papers describing the conversion from other methods to arc-welded construction of parts of machines, complete machines, trusses, girders, or structural parts. The subject may be something which the student has observed in school shops, magazines, books, printed matter, or elsewhere; or he may conceive of an application which has never been employed but which could be developed by arc welding. Further details may be obtained by writing **The James F. Lincoln Arc Welding Foundation**, P. O. Box 5728, Cleveland, Ohio.

BULLETINS

Vibrating Screens. Use of vibrating screens for solid-liquid separations is described in a new booklet issued by Robins Conveying Belt Co., Passaic, N. J.

Lathes. Catalog No. 13, issued by the South Bend Lathe Works, South Bend, Ind., describes a 13-in. precision lathe. Catalog No. 67-W of the same company describes its line of South Bend 2-H turret lathes.

Bearing Metals. Magnolia Metal Co., Elizabeth, N. J., has issued a bulletin describing various lead-base alloys which can be used to replace the tin-base babbitts now restricted by war time regulations.

Rubber Conservation. "How You Can Save Rubber in Your Plant" is the general theme of a new booklet on rubber conservation published by B. F. Goodrich Co., Akron, Ohio, and available on request.

Centrifugal Pumps. A compact compilation of facts on centrifugal pumps has been issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Construction features, sizes, and capacities are listed in order to assist in proper choice of pumping equipment. Ask for Bulletin B6059-H.

Electric Motors. Simplified charts presenting data for quick choice of motors

for war-time applications are included in Bulletin B6052-C published by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

V-Belt Drives. Complete descriptions of Texrope V-belt drive equipment are furnished in Bulletin B6051-C, issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Marcy Mills. Catalog No. 101 of the Mine & Smelter Supply Co., Denver, Colo., presents a complete description of the theory behind the Marcy low pulp discharge method of grinding, and describes the various types and sizes of rod and ball mills available. Installation and operating data are included.

Carbon Brushes. Carbone Corp., Boonton, N. J., has issued a bulletin, No. 942, which provides useful data on carbon brush applications, connections, and detailed specifications.

V-Belt Conservation. Engineering Research Bureau of the Multiple V-Belt Drive Association, 140 S. Dearborn St., Chicago, Ill., announces the preparation of a booklet called "23 Ways to Conserve the Life of Your Multiple V-Belt Drives," which will be sent to anyone requesting it.

Metal-clad Switchgear. Horizontal drawout metal-clad switchgear in 100,000, 150,000, and 250,000 Kva. capacities at 5,000 and 15,000 volts is described and illustrated in a new 12-page publication, Catalog 1110, just released by Roller-Smith Company, Bethlehem, Pa.

Extinguisher Maintenance. Pyrene Mfg. Co., Newark, N. J., has prepared a bulletin on fire extinguisher maintenance which should be of particular interest because of the difficulty of buying new extinguishers.

Blue Torches. A 6x10 in. wall card is available on application to Turner Brass Works, Sycamore, Ill., which presents service and maintenance information on blow-torch equipment of various kinds.

Power Transmission. New American Econ-o-matic drives are discussed in a catalog of power transmission equipment just released by American Pulley Co., Philadelphia, Pa. Operating and installation data and suggestions for designers are included.

Foundry Shakeouts. A new bulletin, No. 124, of Robins Conveying Belt Co., Passaic, N. J., describes several styles of foundry shakeouts used for removing sand from castings and flasks.

Oil Burners. The Hauck proportioning oil burner, which is said to provide most efficient oil-air ratios, is described in a new bulletin of Hauck Mfg. Co., Brooklyn, N. Y.

Lathe Oiling. Latest of a series of bulletins on lathe service issued by South Bend Lathe Works, South Bend, Ind., is "Oiling the Lathe," which outlines a regular procedure of oiling and defines proper lubricants.

Chain Drives. Folder No. 1951, published by Link-Belt Co., Chicago, Ill., tells how to keep chain drives running when replacements are unobtainable, and supplies service suggestions that will keep them running longer.

Metallizing. Various applications of metallizing in industry are discussed in a bulletin just issued by Metallizing Co. of America, Chicago, Ill. The company's line of Mogul metallizing equipment is also described.

Drive Control. Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., has prepared a 14-page booklet describing application of the Rototrol, a d.c.-drive control unit which provides satisfactory speed control for mine hoists, electric shovels and draglines, and similar equipment.

Electric Drills. Proper use of electric drills is demonstrated in a new booklet of Black & Decker Mfg. Co., Towson, Md., which illustrates the various important points of maintenance and repair of this equipment.

Steam Hose. Simple, easy to read rules for the maintenance of steam hose are contained in a recent publication of B. F. Goodrich Co., Akron, Ohio.

Truck Lubricants. Standard Oil Co. of Indiana has prepared a bulletin on fuels and lubricants for trucks and buses which is designed to help owners of commercial vehicles to maintain trouble-free operation under the present emergency conditions.

Mercury-Arc Rectifier Transformers. Described and illustrated in Bulletin GEA-3883 of General Electric Co. are details of two mercury-arc rectifier transformers of the 6-phase and 12-phase, oil-immersed types which are typical of sizes both above and below 1,000 kw.

Washington Reflections

(*Continued from p. 42*)

nothing but a bookkeeping entry between government agencies.

The treaty contains the usual "escape clauses," which permit cancellation of specific concessions under certain conditions, such as damage to domestic industries, currency manipulation, and a new basis having to do with the effectuation of government controls over industry. However, in view of the past attitude taken by Administration in refusing to exercise these escape clauses when the specified conditions arose, the affected domestic industries can expect small comfort from the escape clauses unless there is a change of administration.

Import Mexican Miners

WAR Manpower Commission's proposal that Mexican mine labor be imported into the United States to work in Western metal mines has resulted in a formal request from the State Department to the Mexican government for an initial working force of 3,000 men. Reports in Washington in early January indicated that the manpower aid from across the border had already begun and led Manpower Chief McNutt to predict that the first 3,000 workers would be followed by additional thousands as they could be absorbed.

The Mexican importation is the third major step taken to alleviate the critical labor shortage in the mines, which, last summer, was estimated to have cut copper, zinc and other metal production by from 10 to 25 percent of capacity.

Release of 38-Year-Olds

EMPLOYERS must not assume that the new policy of releasing 38-year-old and older men will work automatically, as the rules laid down prescribe an involved procedure before a man can be released. The regulations governing the release of such men include the following provisions:

"a. The soldier has voluntarily requested discharge in writing to his immediate commanding officer.

"b. The soldier is handicapped by advanced age, 38 years and over, to such an extent that his usefulness to the Army is secondary to that of industry.

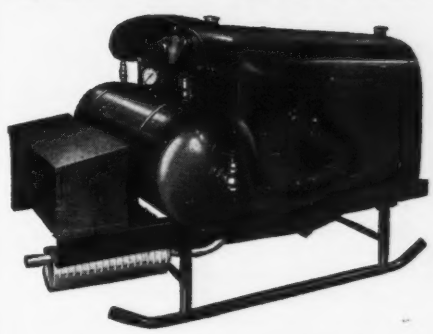
"c. The soldier has presented satisfactory evidence that he will be employed in an essential war industry, including agriculture, if he is discharged from the Army.

"Each application for discharge under the above conditions will be considered on its individual merits and no soldier will be discharged unless a suitable trained replacement is present and available."

Save time and money with this new VICTORY MODEL SMITH AIR COMPRESSOR

(less critical material than any other standard compressor)

SMITH AIR COMPRESSORS



You know how vital SPEED is now. But, have you thought how you can speed-up your compressor operations with lightweight, flexible Smiths? Did you know that large, cumbersome compressors may be replaced on a majority of compressor operations?

60 cu. ft. size (illustrated above) uses only 1 gal. of gasoline an hour. Made with FORD MOTORS and standard parts, the ruggedness and efficiency of these famous compressors are sources of constant satisfaction to users everywhere. Wire, phone or write today for complete information!

With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

Write for free Booklet

GORDON SMITH & CO.
INCORPORATED
505 College St. Bowling Green, Ky.

OBITUARIES, APPRECIATIONS

(*Continued from page* 73)

acter and kindly understanding, though not acceptance, of human failings.

The artistic side of his character was chiefly expressed through music. A considerable native talent was augmented by a knowledge and appreciation of good music, and acquaintance with artists. In this field he gave as well as found much pleasure and relaxation.

To have known Dr. Becket has brought pleasure to a host of friends; to have worked with him, gratification and gain to many. Graciousness and exhilaration marked all intercourse with him. His inspiration animated scientific work, gave it romance, and added the satisfaction derived from pioneering. Few men possess such qualities, and the one who does can be ill spared; but his memory will remain a challenge to higher accomplishment and a stimulation to greater amity.

J. H. CRITCHETT

LETTERS

Mining and Post-War Policies

THE EDITOR:

YOUR EDITORIAL STATEMENT on mining and post-war policies interested me greatly because, in addition to the implications of paragraph four of the Atlantic Charter which you have noted, I have also observed a tendency among various of the "high-thinking" groups to read into it even more than it seems to say. Since its apparent suggestion of a post-war world based on free trade of the kind predicated by Adam Smith and John Stuart Mill seems quite impracticable (as suggested by the weasel words "with due respect to their existing obligations"), nothing but additional confusion can result from arousing expectations that cannot possibly be fulfilled.

The tendency in these far-reaching proposals is to hang the clothes on a hickory limb but not go near the water. A good example of that was the Kellogg Pact, which renounced war as an instrument of national policy, without coupling with it recognition of the fact that war is essential to preserving peace, as every policeman knows. Perhaps it was thought politically too difficult to get adherence to the first proposition if its necessary corollary were coupled with it, but time has shown that the one without the other is completely useless.

The next point I would like to make is that while discussion of these matters is necessary so the mining industry will have a thoughtful and well-considered viewpoint of its own, it will be ineffective as a force unless some general agreement is reached. Discussion should be centered on some topic which meets best the two conditions of being of much importance and of offering a reasonable chance of reaching agreement. Control of international trade in minerals seems to be such a definite topic, and it would not be too hard to set forth the basic realities of it.

General agreement can be reached on the proposition that international trade, like any other flow, must be controlled to function effectively. In this country there are a great many theorists who, while recognizing that fact in international trade, insist that its internal control must be by government instead of by the industries concerned in the trade. Possibly that is because the controls which had developed were initiated by producers and seemed to take too little account of the consumer. That is a debatable question, but in any case the remedy is to draw the consumer into the control, instead of committing his interests to government agencies which know much less about what they really are than an intelligent producer does, and which have to employ political means of functioning.

There is little hope of easily convincing these gentry, but the mining industry ought to be able to agree that all experience has shown that the only really effective controls of trade are those self-imposed from within, instead of from without, and that the defects which they show in practice can be more easily corrected than the fundamental defects in government control. The abuses of which that is capable were illustrated by the attack on the Standard Oil patents, not long ago, as well as those on Alcoa.

Experience has indicated that the practical means for self-control of international trade are the so-called "cartels." Though these have not, so far, worked too well, it has been, in part, because in the country which has the largest part in international trade they have been regarded with something like the same horrified intolerance that marks the attitude toward birth control in some parts of the country, and for much the same reason—the holding of a basic belief that is impervious to any logical argument. It has also been due to lack of adjustment between political controls and self-controls, and perhaps this is the reason why the mechanisms themselves have not been sufficiently perfected to work better than they have.

Since those who regard cartel control with horror approve of government control, and cannot be unaware that European governments which control industry have recognized the cartel system as an effective mechanism, it might be possible to convince them that it would be wise for the United States to get in step with the rest of the world and legitimize self-control of industry from within. Granted that, it may be possible, though harder, to convince them that the best government is the one that governs least, because it has so arranged matters that control is not needed. It is not necessary to keep tinkering with a well-designed and well-constructed mechanism; it runs better without it.

Even an inventive genius, after getting a good idea, has to spend a long time reducing it to a practicable basis; sometimes somebody else has to do it for him. Government is permeated, nowadays, with people who are inventive but no geniuses, and largely devoid of capacity to reduce anything to a practical working basis. The mining industry should not think it can safely proceed on the basis of letting politicians and uplifters set up a system, and then criticise its defects. The industry should be ready with definite and concrete proposals of its own, clearly and forcefully presented.

General discussion will be helpful, but after that should come definite formulation, and general support. The first and last of these three is for everybody, but the second is a job for a few. Since ours is a representative government, interested organizations might well delegate that task to a group which is in a position to do it. You have made a good start; let's hope the mining industry can make a good finish.

THOMAS T. READ

Columbia University, N. Y.

Scrap Drive—Jap Style

THE EDITOR:

YOUR EDITORIAL in the November issue of *E.&M.J.*, on "Scrap Drive—Jap Style," is interesting and true up to the point where it reflects upon the profit motives and patriotism of the possessors of scrap metal. From this point on you entirely ignore the profit that every one else makes in handling and fabricating the metal, and their patriotism is not even mentioned; yet because the possessor of this scrap wants to make a little profit, you question his patriotism. Do the junk dealers, truckers, transportation companies, and manufacturers handle and fabricate this metal with patriotism as their only pay? They do not, for each and every one who handles the material makes a profit. Why, then, should not the possessor of this product that enables every one else to make a profit also make a profit? Did the Allied Manufacturers who put up a $2,500,000 advertising fund in the scrap-metal drive do so with the thought that patriotism would be their only pay? Again they did not, for the profit motive underlay the whole plan; yet their patriotism is not questioned.

The reason that more success was not attained in the scrap metal drive, was due to the fact that the War Production Board views scrap metal as worthless to those who possess it. This is wrong thinking. Compare scrap metal with a metal mine: Today the market for the metal is so low that a particular grade of ore is worthless, but tomorrow this particular grade of ore becomes profitable due to an increase in the market price for the metal. All that is necessary to obtain all the scrap metal that is needed is to increase the price sufficiently so that those who possess it can make a small profit. Patriotism does not enter into the picture. If none who handle and fabricate scrap metal made a profit that would be an entirely different matter, but it is the knowledge of the profit made by others, at the expense of the holders of scrap metal, that retards its free flow to the manufacturers.

Last July, I pointed out to the War Production Board that the Jap had gathered up a large quantity of the easily obtainable scrap metal, that much of the scrap that could be obtained involved expense to get it to transportation, suggesting a reasonable price that would cover this expense and yield a small profit. Considerable correspondence ensued, which clearly indicated that the WPB was totally ignorant of

conditions where large quantities of scrap existed, and, in addition, were biased in favor of certain handlers of the metal.

There is no shortage of scrap metal in the country, and as there is no shortage of money for anything that is needed in the war effort, why not make money available for this vital necessity, so that the holders of this material can make a profit, and enable them to assist in financing the war effort by purchasing war bonds? KENNETH K. ASH

Yreka, Calif.

Bolivia

THE EDITOR:

IN MY ARTICLE ON BOLIVIA, published in your August number, I made the following statement:

"Hochschild is perhaps the leader in experimentation and introduction of new methods for the beneficiation of tin ores. A few months ago a sink-and-float plant was installed in Colquiri, but last reports say that this plant is being torn down for re-installation in Unificada."

I am in receipt of a communication from R. R. Beard, general metallurgist, Mauricio Hochschild S.A.M.I., in which he stated that

"The Colquiri heavy-density plant started operation in October 1941. There has never been any discussion concerning the dismantling of the plant, as it is working satisfactorily. We have under consideration a heavy-density unit for Unificada, but the decision on this has not yet been made. If installed, it will be constructed from new equipment."

The original data were obtained in La Paz office of Mauricio Hochschild, S.A.M.I., but in the interest of accuracy, I think you should publish this correction. G. V. BILBAO LA VIEJA

Banco Minero de Bolivia,
La Paz, Bolivia.

"Minerallurgy"

THE EDITOR:

I NOTICE in the two letters in the November issue of the *Engineering and Mining Journal* headed "Minerallurgy," the terms ore dressing, ore separation, mineral dressing, minerallurgy, and metallurgy, but not "geolurgy" or the old term "milling." "Mineral separation" is a term that has been familiar to the mining fraternity for two generations at least, and I like it because it is fully descriptive and therefore understandable to a layman as the science of separating one or more minerals from rocks, gravels, clays, or muds. H. I. SMITH

Geological Survey,
Washington, D. C.

Ban on Gold Mining Stirs Engineer

THE EDITOR:

SO THE MINING OF GOLD is now forbidden. This calls to mind a line in an ancient song where the shamrock is forbid by law to grow on Irish ground.

I came in to Cripple Creek from the South, and to bring events up to that point it will be enough to say that I had already served several hitches as a tramp engineer. For the information of the uninitiated, there is nothing opprobrious about that epithet. In those days, at least, no engineer ever found a path beaten to his door. When he ran out of a job, he looked through the financial papers till he found where some promoter had been staked to enough to build a piece of railroad, or a dam, or a port, and he just went there —horned in and worked out the bugs. Personnel records and civil service commissions and unions were not invented until the country stopped being in a hurry to build itself up. The promoters themselves were in doubt whether they would come out of the enterprise "broke" and branded as crooks, or rolling in dough and praised as some of the greatest developers of all time.

So I had gone from a mountain railroad in Colorado down to dodging jails and wars on a transcontinental road in Mexico where the promoter left us gasping for breath and pay as he crossed the line ahead of the Rurales.

Back to the U. S. to help a mining millionaire irrigate the valley of a river which turned out to be the Ganges in disguise, cutting around our dams and leaving us high and dry in the middle of a Wall Street panic.

So back to first principles on a silver strike in Mexico and a side issue as press agent for a promising revolution backed by an able bunch of cattle rustlers.

All this by way of accounting for coming in to Cripple from the south; and late at that, for I found myself No. 101 on the tramp register. A hundred others had already identified it as the only possibility in the United States for an engineer. It was unique in history, new in every respect. Geologically and mineralogically, it offered no clues to the prospector. To the cowpuncher who built up a shelf at the edge of his fire for his coffee pot with a few pieces of black, slate-like rock nothing was more remote from his mind than the idea that he was to add a chapter of new mining knowledge to the books. But when, following a time-honored custom, he scattered the embers and found that out of the black rocks had boiled globules of gold, he knew he had something that put his cow business in the discard.

A year later cattle were breaking their legs in hundreds of prospect holes, shafts dotted the flat hill slopes, a branch from the railroad was coming up the gulch, shacks were replacing tents, a great, four-story hotel was going up, and a bartender, helped by an assayer, had developed the Trilby cocktail. The tramp engineers designed the water supply, a system of sewers, laid out streets, became mineral land surveyors, mining engineers, tried to gather information from the workings to determine strikes and dips of igneous veins only to be confounded by new discoveries that followed no law but the vagaries of volcanic shoots. For all practical purposes, apex and sideline laws, precedents and court decisions were so much excess baggage to a lawyer in Cripple Creek.

And, presently, it became evident that the science of finding fractions between side or end lines of claims in proven territory, if no larger than ground enough to sink a shaft and reach dumping ground with an aerial tram, was to become a specialty of resourceful engineers.

I tied in with the most aristocratic tramp in town, the only one who not only possessed a plug hat and accompanying wardrobe, but had the nerve to sport it, stick and yellow gloves and all, down the main street on a Sunday morning. He was not only tops in his line but also painted a little, sculped a little, boxed like a heavy champ, and was adored by the ladies of all degrees. We got the second floor corner in the only two-story all-brick in town at the top of the most notorious street for a nominal rent on the ground that we would give the building the cachet of respectability, the need of which the owner freely admitted.

One day while we were there the door opened to admit a big sixfooter with a sweeping blond mustache who was recognized at first glance as the former chief of an enterprise in the Southwest who had busted up a rancher's family by running off with his wife, a lady of undeniable charm, who after one look at this Greek god, had made up her mind. The departure, via handcar, was aided and abetted by everybody but the rancher and kept from him for two days, so there was no shootin'. It seemed that Bill had found a job under a tyrannical chief with a pious front and no virtues acceptable to the tramp fraternity, laying out the railroad yards. Flustered by a nagging boss and a wire from the lady that the decree was signed and it was up to him, he was unable to figure out a wye and wanted help bad and right away. So we took his notes and gleefully fixed him up, scoring one for ourselves in remembrance of the haughty air of Bill's boss on other occasions, to say nothing of expediting the law's benison on a lady who was always perfectly honest.

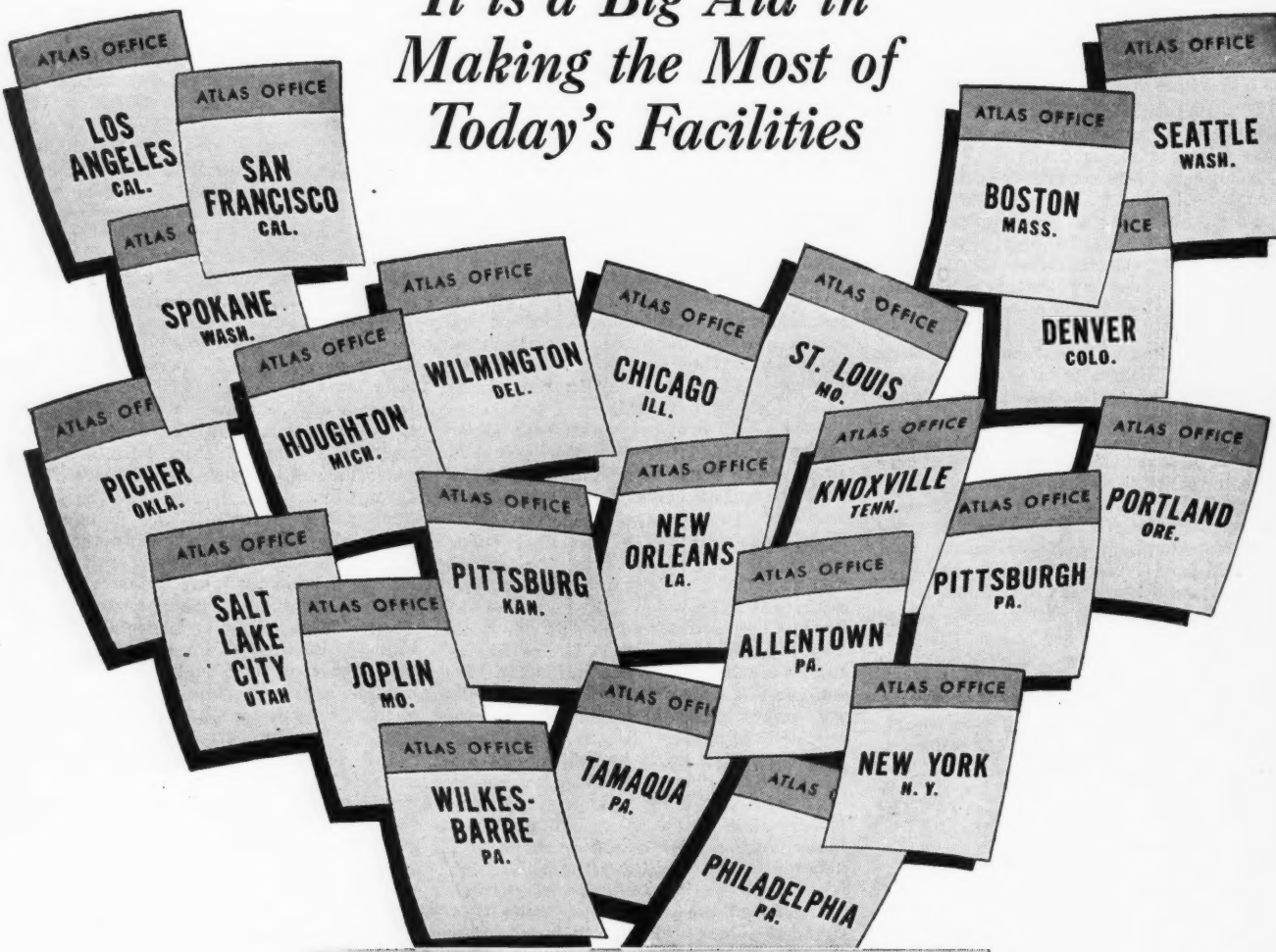
Bill had hardly departed when the firebells rang. Looking out of the window at the rear of the building, I saw a good start of a blaze at the back of the honky-tonk theater two doors away. Talking it over with the boys, we concluded we had better start moving before everybody else thought of it. So we commandeered an express wagon, got everything aboard and moved out to the edge of town—about a mile away. There was little wind then, but the wagon had hardly started back when a gale created by the fire itself commenced to blow sparks in our direction and presently we had to pick up the most precious of our belongings and get on the road again, demonstrating Ben Franklin's statement that two moves are as bad as a fire. By midnight the town had wiped out its past and was starting all over again, bigger and better, but without the prime salty flavor that had commended it to the tramps. But in its renaissance it hung on to the latent ability to meet and overcome all obstacles. Witness the completion of the bold scheme of a great drainage tunnel, which points the way to the recrudescence of many a proven but waterlogged district that has the stuff we need for the big demolition job now under way in which the tramps again find the going to their liking.

JAMES PATRICK

Washington, D. C.

When the Helping Hand is Near At Hand–

It is a Big Aid in Making the Most of Today's Facilities



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